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Transport of actinides and Tc through a bentonite backfill containing small quantities of iron, copper or minerals in inert atmosphere

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April 1990

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ABSTRACT

In the Swedish concept for final disposal of high-level radioactive waste, compacted bentonite has been proposed as a suitable backfill. In order to study the possible effects of different additions to the clay on the transport of REDOX-sensitive nuclides an investigation has been performed where small quantities of iron or copper in different oxidation states or minerals have been added to the clay.

The apparent diffusivity (D_a) of the actinides U, Pu, Np and the fission product Tc in compacted bentonite mixed with 1% Fe(0), Fe(II), Cu(0) or Cu(II) and for Np and Tc with 1 or 10% respectively of vivianite ($Fe_3(PO_4)_2$), magnetite or fracture fillings (mainly epidot and chlorite) has been measured in an inert nitrogen atmosphere. The results indicate, especially in the case of Fe(0) or Fe(II), reduction from the higher oxidation states Np(V), U(VI) and Tc(VII) probably to Np(IV), U(IV) and Tc(IV). D_a is reduced by several orders of magnitude, and for Tc with Fe(0) addition no migration could be measured (e.g. $D_{a(Tc,Fe(0))} < 2 \cdot 10^{-16}$ m^2/s, $D_{a(Tc,Fe(II))} = 5 \cdot 10^{-13}$ m^2/s, $Da_{(Tc,Cu(0))} = 5 \cdot 10^{-12}$ m^2/s) while in the case of Cu(I) the effect is not so pronounced, $D_{a(Tc,Cu(I))} = 2 \cdot 10^{-11}$ m^2/s. U and Np show the same trend ($D_{a(U,Fe(0)} = 1.2 \cdot 10^{-14}$ m^2/s, $D_{a(U,Fe(II)} = 2.8 \cdot 10^{-14}$ m^2/s, $D_{a(U,Cu(0)} = 1.4 \cdot 10^{-13}$ m^2/s; $D_{a(Np,Fe(0)} = 9.2 \cdot 10^{-16}$ m^2/s, $D_{a(Np,Fe(II)} = 3.5 \cdot 10^{-14}$ m^2/s, $D_{a(Np,Cu(0)} \approx D_{Np,Cu(I)} = 1.4 \cdot 10^{-13}$ m^2/s. For plutonium no diffusion can be measured in the time scale used, $D_{a(Pu,FeO)} < 3 \cdot 10^{-16}$ m^2/s.

For the minerals no change in diffusion rate was achieved in the case of 1% addition of the minerals. However, for Tc with addition of 10 % of the minerals and long pre-equilibration time, especially for magnetite and fracture fillings, indication of reduction is pronounced.

Further experiments with Pu are still in progress due to long contact times.

1. INTRODUCTION

The Swedish concept for final disposal of high-level waste has been concentrated on a multiple barrier system in cristalline rock at a depth of about 500 m (SKB83). The burnt-out fuel will be put into metal canisters as a first barrier and pure bentonite is proposed as a second barrier.

In order to decide what possible effects the corrosion products from the canister containing the burnt-out fuel could have on the transport of the nuclides, an investigation has been performed adding small quantities of iron or copper in different oxidation states.

Also addition of different minerals (magnetite, vivianite and fracture fillings) as possible retarding agents for Tc and Np have been tested.

2. EXPERIMENTAL

2.1 RADIONUCLIDES

Table 1. Decay data and amount radionuclide added in the experiment for the used radionuclides.

Nuclide	Decay	$t_{1/2}$ (years)	Total amount added (moles)
^{99}Tc	β^-	$2.1 \cdot 10^5$	$2-4 \cdot 10^{-8}$
^{233}U	α	$1.6 \cdot 10^5$	$1-2 \cdot 10^{-9}$
^{237}Np	α	$2.1 \cdot 10^6$	$4-8 \cdot 10^{-8}$
^{239}Pu	α	$2.4 \cdot 10^4$	$4 \cdot 10^{-10}$

The elements used (U, Np, Pu and Tc) are of interest for the longtime hazard in a final disposal of radioactive waste. The actinides have different oxidation states depending on the redox potential, and Tc is an anion in oxidizing conditions but a cation in reducing conditions.

The isotopes used, their half-lives and total amount added are shown in Table 1.

2.2 MATERIALS AND METHODS

2.2.1 <u>Materials</u>

The clay used was a sodium bentonite (MX-80, Wyoming bentonite). The clay was preequilibrated for more than two weeks with an artificial groundwater, after which it was centrifugated with an average centrifugal field of 22000 g for 30 minutes. The clay was then dried in an oven at 105 °C and finally ground in an agate mortar. The clay was then loaded into the diffusion cell described below and compacted to a density of 2000 kg/m^3. From then on the experiment was performed in a box with nitrogen atmosphere containing less than 0.05 ppm oxygen, see Fig. 1. The entire cells were submerged in the artificial groundwater for more than one month (in the case of 10% addition of minerals, preequilibration > 1 year), in order to wet the clay completely.

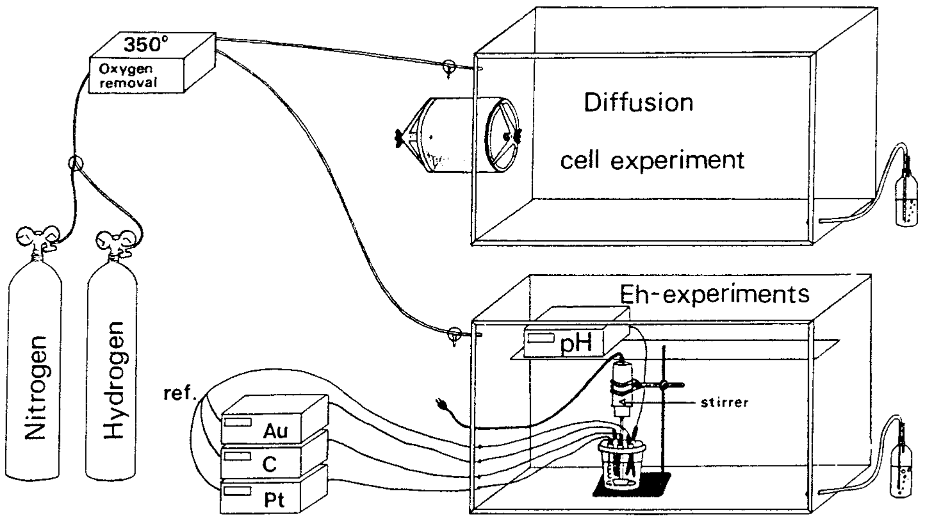

Figure 1. Inert system used in the diffusion experiments.

The water used was an artificial groundwater representative of Swedish deep granitic groundwater (TOR83, ALL79).

2.2.2 Apparatus and measurement technique

Fig. 2 illustrates the main parts of the diffusion cell. In order to introduce the activity into the cell, a slurry of the clay was placed on a glass plate and was allowed to dry. This gave a thin plate (≈0.2-0.5 mm thick) of dried fine-grained clay. The solution containing the activity (usually 0.1 mL) was dropped onto the clay-plate under an IR-lamp and slowly evaporated. The radioactive clay-plate was then placed on an equilibrated clay cylinder in the diffusion cell and another clay cylinder was pressed on top of it, see Fig. 2.

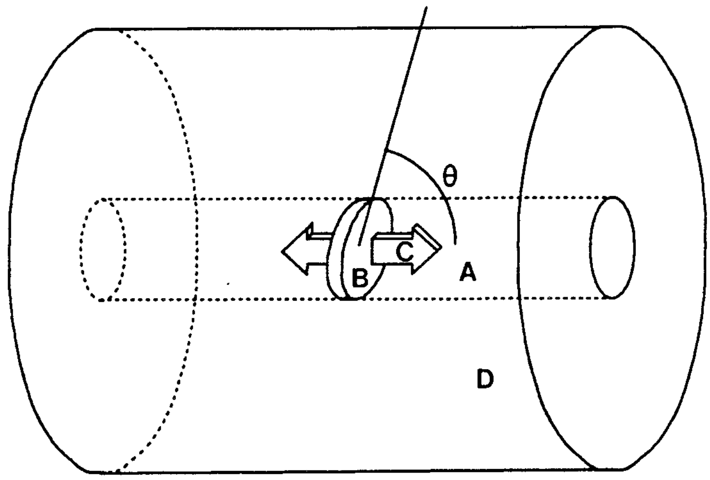

Figure 2. Schematic drawing of the diffusion cell. A Compacted bentonite, B Thin clay-plate originally containing all the radioactivity , C Diffusion direction, D Sample holder of stainless steel and θ is the angle of the clay-plate initially containing all the radioactivity.

After an appropriate time, the diffusion cell was opened, and the clay cylinder was pressed through a cutting device, which peeled off the outer part to eliminate wall effects (diameter before = 25 mm, after = 20 mm), se Fig. 3. The remaining clay cylinder was cut into slices of between 0.2 and 0.4 mm (Fig. 3) and put into preweighed bottles. The slices were air dried and the dry weight of each sample measured. The weight of the samples was used for the calculation of a more precise thickness of each slice, see App. 1.

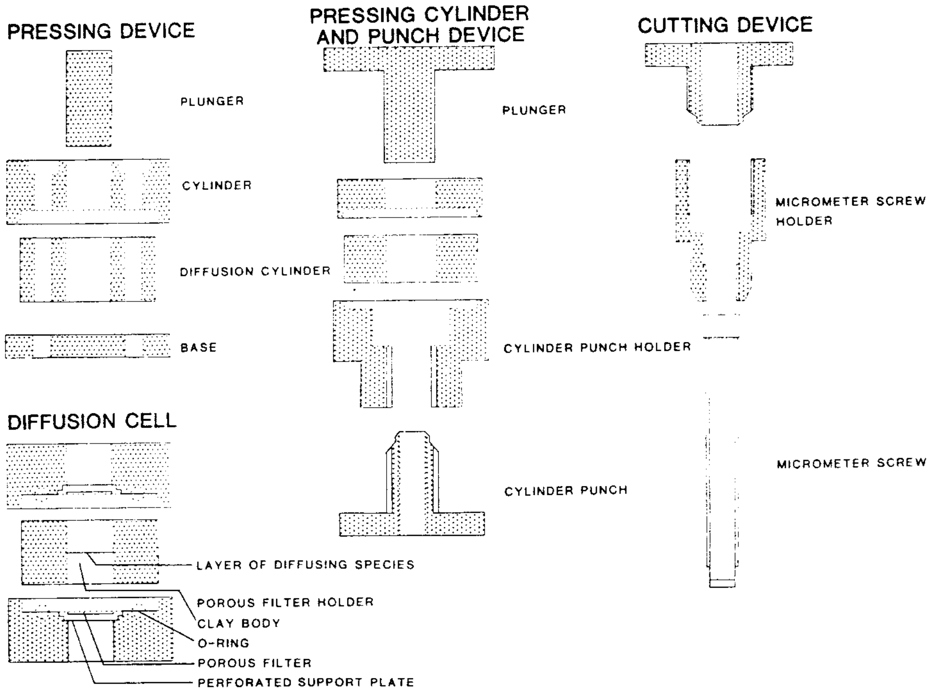

Figure 3. Apparatus for measurement of diffusion profiles.

For U and Pu, first 1 mL of 1 M HCl, and thereafter 15 mL of liquid scintillation cocktail (Pico-Fluor 30, Packard Instruments AB) was added to the slices. The activity was then measured in an liquid scintillation detector (Intertechnique SL-30, France). The background activity was measured using exactly the same method, with the same amount of clay, in order to correct for naturally occuring ^{40}K content in the clay. In the case of Np the samples were first measured using a 3"*3" NaI(Tl)-detector (Intertechnique GC4000), measuring the gamma ray at 312 keV (App. 1, cpm/g NI). Thereafter Np was extracted from the weighed clay-slices with 2 mL of 1 M HCl + 0.06 M $NaBrO_3$ standing overnight. The tubes were then centrifuged with a centrifugal field of about 300 g. 1 mL of the supernatant was mixed with 15 mL of liquid scintillation cocktail and measured on the liquid scintillation detector (App. 1, cpm/g 1d). The scintillation bottles were then stored in a refrigerator and remeasured after 3 months (App.1, cpm/g 3m) in order to detect the influence of the neptunium daughter protactinium

$^{237}Np \xrightarrow{2.1E6\ y} {}^{233}Pa \xrightarrow{27\ d} {}^{233}U$

on the measured diffusion (cf Table 2, $D_{a(Np,FeO)}$).

For Tc the same extraction method was used as for Np.

2.2.3 <u>Possible experimental limitations</u>

A problem occuring in the case of nearly immobile ions is the angle and the shape of the clay-plate originally containing all the activity. Near the center (x=0, taken as the slice which gave the highest specific radioactivity), the slices will possibly contain fractions of the initial radioactive plate and thus give a positive bias to the measured radioactivity, (cf. Fig. 3 and 4).

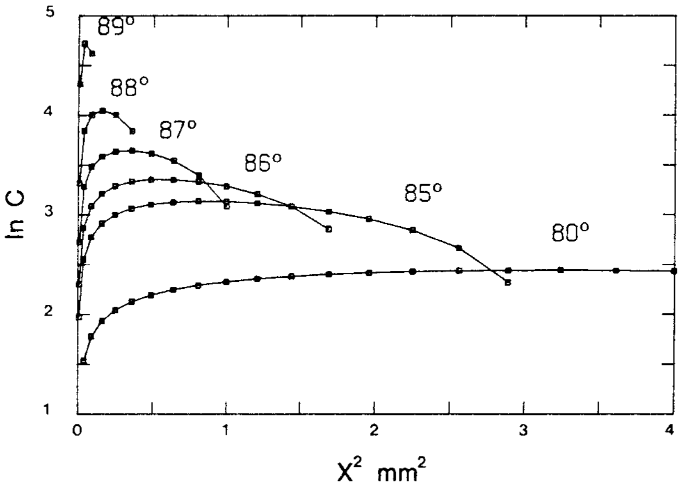

Figure 4. Theoretical concentration profile without any diffusion as a function of the angle of the clay-plate originally containing all the radioactivity.

The above mentioned consideration is reasons enough to be careful when evaluating the validity of the D_a-values obtained for the almost immobile ions. The D_a-values are probably a function of:

- the shape and angle of the initial plate
- how the slicing was done
- the amount of radioactivity added
- the contact time.

Thus mostly depending on experimental parameters and not the migration of the ions, although giving a maximum diffusion rate (ALB89).

3. DIFFUSION THEORY

Diffusion of a trace element through a porous media is mainly dependent on molecular diffusion in the aqueous phase, on sorption phenomena, and on the pore constrictivity and the tortuosity due to the solid. The general transport equation, which accounts for both advection and dispersion can be reduced to a diffusion equation which, if the relationship between the concentration of the solute on the solide phase and the concentration of the solute in the solution is linear and reversible, can be written (CAR59)

$$\frac{dC}{dt} = D_a \frac{d^2C}{dx^2} \qquad (1)$$

where D_a is the apparent diffusivity of a reactive solute in the medium.

The solution of Eq. (1), in one dimension, when D_a is constant and independent of concentration, is (CRA75)

$$\frac{C}{M} = \frac{\exp(-x^2/(4D_a t_c))}{2\sqrt{\pi D_a t_c}} \qquad (2a)$$

where C = concentration

M = total amount of diffusing species per unit area

x = distance from initial source

t_c = contact time

Eq. 3a can be rewritten as

$$\ln C = \ln(0.5\ M/\sqrt{\pi D_a t_c}) - (1/(4D_a t_c))x^2 \qquad (2b)$$

which plotted as ln C versus x^2 yields a straight line giving D_a from the slope (TOR86).

For the diffusion process, the retention time, t_r, defined as the time when the concentration on the outside of the clay barrier reaches 5% of the concentration at the source, is given by (CAR59)

$$t_r = 0.1\ z^2/D_a \qquad (3)$$

where z = barrier thickness (m).

4 RESULTS AND DISCUSSION

4.1 TECHNETIUM

Under oxidizing conditions, technetium is negatively charged (TcO_4^-) and non-interacting with the clay. Under reducing conditions technetium is tetravalent (Tc(IV)) with a solubility in basic solutions in the range 10^{-8}-10^{-9} M (MAY89). The E^o-value for the Tc(VII)-Tc(IV) couple has been determined to 0.75 V by Mayer et. al.

4.1.1 Iron and copper addition

In all experiments the diffusion rates are significantly lower than in oxidizing conditions. With Tc, the slow diffusion rates in this investigation clearly indicate reduction from Tc(VII) (TcO_4^-) to probably Tc(IV).

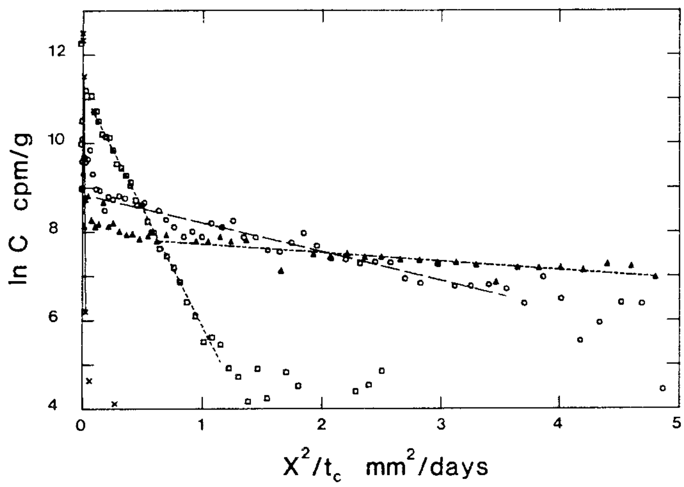

Figure 5. Concentration profile for Tc in compacted (2000 kg/m^3) bentonite. C is the concentration expressed as cpm/g, x is the distance from the clay-plate originally containing all radioactivity and t_c is the contact time in days. 1% Fe (x), 1% FeO (□), 1% Cu (O) and 1% Cu_2O (Δ).

The diffusion rate is decreasing in the order oxidizing conditions ≈ Cu(I), inert > Cu(0), inert > Fe(II), inert >> Fe(0), inert (cf. Table 2). The migration speed has roughly gone down by a factor of ten in the order above, thus giving a decrease in the apparent diffusivity of about 400000 times in case of elementary iron addition, cf Fig. 5. With Fe(0)-addition no movement can be seen, even after 552 days, thus indicating total reduction, and the D_a-value is about $2 \cdot 10^{-16}$ m^2/s.

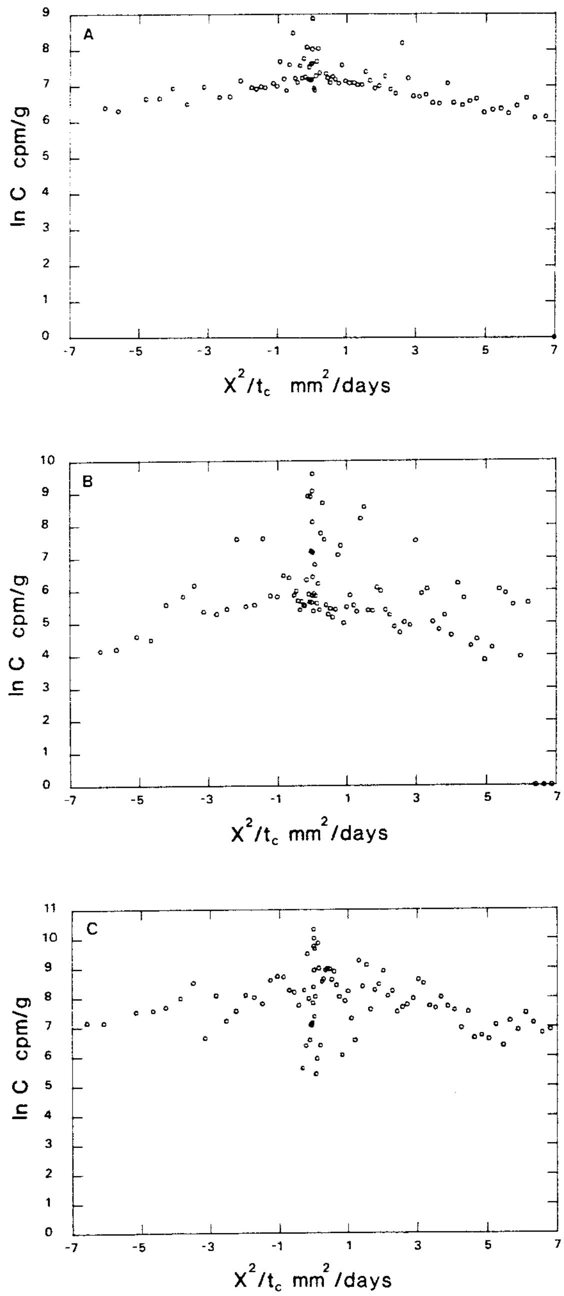

Figure 6. Concentration profile for Tc in bentonite with a) 10 % vivianite, b) 10% magnetite and c) 10% fracture fillings. x is the distance from the slice giving the highest activity.

One also has to consider that the value given for Tc with

Fe(0) is a maximum value, and thus almost only depending on the chosen experimental conditions (cf. 90 days respectively 522 days contact time, Table 2). Also, in these experiments the minimum detectable concentration in the water is about 10^{-6} M, thus saying that if Tc is reduced, the solubility limit of Tc(IV)-hydroxide is exceeded and precepitation will occur.

4.1.2 Addition of minerals

Different amounts of the iron-containing minerals vivianite, magnetite and fracture fillings from the Stripa mine (mainly epidot and chlorite) were added to the clay as a possible "getters" for the technetium. The concentration profiles are very scattered, especially for magnetite and fracture fillings, thus indicating partly reduction in some spots along the diffusion path. No D_a-values can be given since the speciation changes along the migration path, cf Fig. 6.

4.2 NEPTUNIUM

The pentavalent state dominates in oxidizing conditions (NpO_2^+). Under reducing conditions the tetravalent state dominates, with a solubility product log K_{sp} = -54.5 (RAI87), and a solubility of less than 10^{-9} M (probably less than 10^{-20} M) (LIE85).The standard potential for the Np(V)/Np(IV) couple is 0.94 V (ALL85).

4.2.1 Iron and copper addition

The D_a-values for Np is following the same trend as for Tc, i.e. Da is decreasing in the order oxidizing conditions ≈ Cu(I), inert ≈ Cu(0), inert > Fe(II), inert >> Fe(0), inert (cf. Table 2 and Fig. 7) with D_a-values going from $4\cdot10^{-13}$ m^2/s (aerated) to less than $1\cdot10^{-15}$ m^2/s for Fe(0)-addition. There is no depence on the daughter ^{233}Pa for the diffusivity, except in the case of Fe(II)-addition. In this case two D_a-values can be distinguished, with a slightly slower diffusivity for the ^{233}Pa (1.8 respectively $3.5\cdot10^{-14}$ m^2/s).

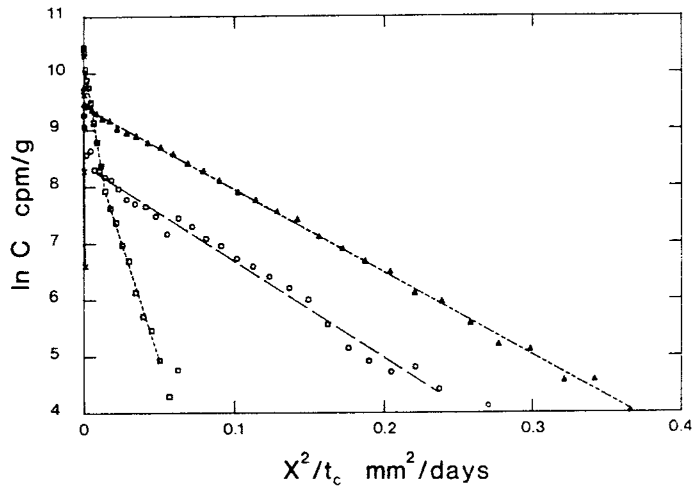

Figure 7. Concentration profile for Np in compacted (2000 kg/m^3) bentonite. C is the concentration expressed as cpm/g, x is the distance from the clay-plate originally containing all the radioactivity and t_c is the contact time in days. 1% Fe (x), 1% FeO (□), 1% Cu (O) and 1% Cu_2O (Δ).

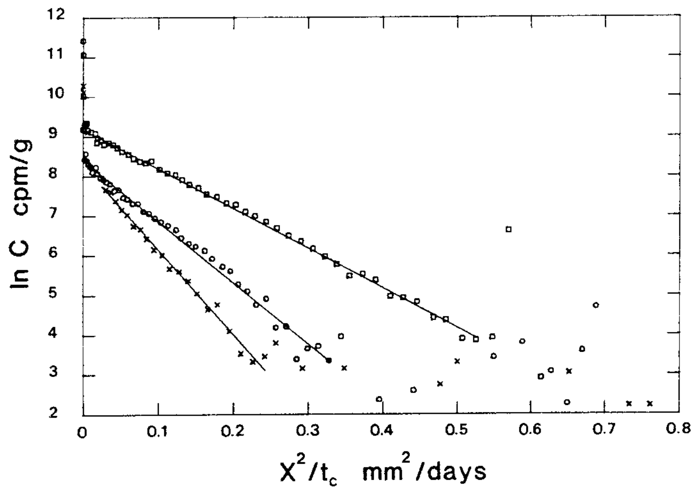

Figure 8. Concentration profile for Np in bentonite with (x) 1 % vivianite, (□) 1% magnetite and (O) 1% fracture fillings. Preequililbration time 1 month. x is the distance from the slice giving the highest activity.

4.2.2 <u>Addition of minerals</u>

For the three different minerals added (1% of vivianite, magnetite and fracture fillings from the Stripa mine (mainly epidot and chlorite)) respectively, no effects can be detected. The D_a-values are in all cases about $2 \cdot 10^{-13}$ m^2/s, se Fig. 8, wich is well in accordance with diffusivities measured at aerated systems (ALB89, TOR86). No difference depending on the Np-daugter ^{233}Np can be seen, se App. 1.

4.3 URANIUM

Uranium is hexavalent, (UO_2^{2+}), in slightly oxidizing conditions. Under strongly reducing conditions is U(IV)-species dominating with a solubility of less than 10^{-10} M (ALL84) under the chemical conditions in this investigation.

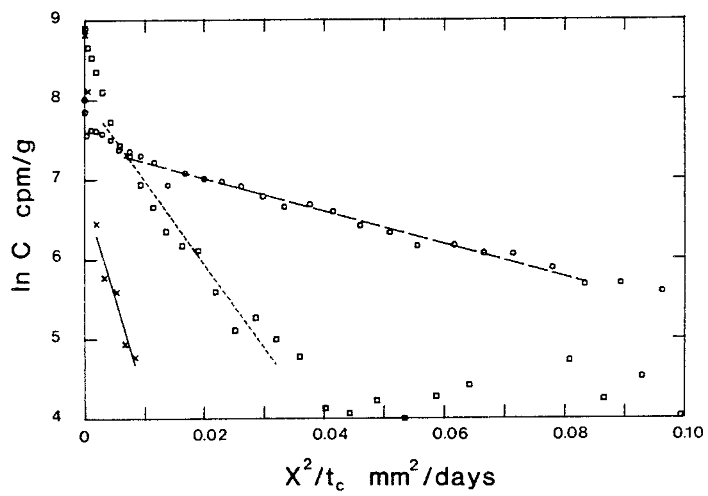

Fig. 9 Concentration profile for U in compacted (2000 kg/m^3) bentonite. C is the concentration expressed as cpm/g, x is the distance from the clay-plate originally containing all the radioactivity and t_c is the contact time in days. 1% Fe (x), 1% FeO (□), 1% Cu (O) and 1% Cu_2O (Δ).

The D_a-values followes the general trend, except that there is only a factor of 2 in D_a between addition of Fe(II) and Fe(0), This factor is much lower than for Np ($D_{a,Fe(0)}/D_{a,Fe(II)}$ $\approx$ 40) and for Tc ($D_{a,Fe(0)}/D_{a,Fe(II)}$ $\approx$ 3000) and for this we have no explanation. With addition of Cu(0) and in inert atmospere, the diffusivity is about three times lower than for aerated systems (TOR86), and with Fe(0)- or Fe(II)-addition, the diffusivity decreases by a factor of ten, cf

Table 2 and Fig. 9.

4.4 PLUTONIUM

Plutonium is tetravalent under slightly reducing or oxidizing conditions. The trivalent state dominates in the solution under reducing conditions (ALL84). The solubility product is low also for the trivalent state, 10^{-7}-10^{-8} M at pH 7-9 (ALL84).

The diffusivity has only been measured in clay with addition of Fe(II). For this experiment, the D_a-value was below $3 \cdot 10^{-16}$ m^2/s, i.e. no movement could be detected (465 days contact time), Fig. 10. This is about 5 times lower value than reported in aerated conditions. However, this difference is probably due to a longer contact time in this investigation, and thus only depending on the experimental parameters. One experiment with Cu(0) is in progress.

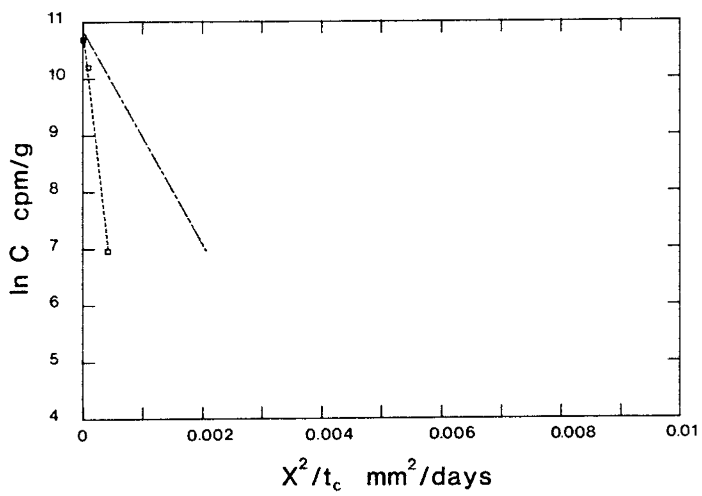

Figure 10. Concentration profile for Pu in compacted (2000 kg/m^3) bentonite containing 1% FeO. C is the concentration expressed as cpm/g, x is the distance from the clay-plate originally containing all the radioactivity and t_c is the contact time in days.
For comparison a bar-dotted line which represents a 50% higher diffusion rate has been added to the figure.

5 CONCLUSIONS

The solubility for all the nuclides studied in this investigation is very low (ALL84, MEY89),

$M(OH)_4$ <===> $M^{4+} + OH^{-4}$ $K_s < 10^{-50}$

and precipitation and low mobility is expected in the pH-range of the experiments (8 to 9), if the tetravalent state is formed. Under oxidizing conditions the expected ions are UO_2^{2+}, NpO_2^+ and Pu^{4+} respectively (ALL84) and the mobility is in the order Np<U<Pu. As expected, the migration rate of uranium and neptunium as a function of addition is in the order Fe < FeO < Cu ≈< Cu_2O. For plutonium the migration rate is very low, and no movement can be measured in the time scale used (>400 days).

In Table 2 the all the apperent diffusivities measured in this investigation (inert atmosphere, different additions) are tabulated together with diffusivities obtained in aerated system with 10%bentonite-90% silica sand mixture. As can be seen, no drastic changes (i.e. in the sence of safety assement) in D_a-values are obtained except in the case of addition of elementary or divalent iron.

For Tc also Cu(I) and Cu(0) gives a decrease in D_a-values with a factor of 5 and 20 respectively. With Fe(II) and Fe(0) the decrease is about 150 and 400000 respectively.

The diffusivity of Np is in the same range for all additions, except for Fe(II) (factor 6 decrease) and Fe(0) (factor 300 decrease).

As a conclusion, the canister material will, for most the nuclides in this investigation (Tc, U, Np), give a significant decrease of the transport through the backfill, and with elementary iron in the clay barrier it would be sufficient to completely retain Tc in the clay buffer (Table 3). For Np a most significant retardation would be obtained. One should also consider the fact that the diffusivities given in this report are maximum values, since the Np and Tc are loaded into the experimental cells as NpO_2^+ and TcO_4^-, and in the case of Fe(II) this would make it possible to have a fast starting migration.

Table 2. Apparent diffusion rate for different experiments

Element (Time)[a]	Reducing agent	Apparent diffusivity, Da (m2/s)	Possible ox. state	Da, in air[b]
Tc(552)	Fe	$1.7 \cdot 10^{-16}$	Tc(IV)	$3.2 \cdot 10^{-10}$
Tc (90)	Fe	$1.1 \cdot 10^{-14}$	Tc(IV)	
Tc (36)	FeO	$5.4 \cdot 10^{-13}$	Tc(IV)	
Tc (25)	Cu	$4.4 \cdot 10^{-12}$	Tc(IV)/(VII)	
Tc (21)	Cu_2O	$1.5 \cdot 10^{-11}$	Tc(IV)/(VII)	
U (387)	Fe	$1.2 \cdot 10^{-14}$	U(IV)	$1.6 \cdot 10^{-12}$
U (381)	FeO	$2.8 \cdot 10^{-14}$	U(IV)	
U (367)	Cu	$1.4 \cdot 10^{-13}$	U(IV)	
Np(380)	Fe	$9.2 \cdot 10^{-16}$	Np(IV)	$4.0 \cdot 10^{-12}$
Np(246)	FeO	$1.8 \cdot 10^{-14}$ [c]	Np(IV)	
		$3.5 \cdot 10^{-14}$		
Np(148)	Cu	$1.7 \cdot 10^{-13}$	Np(IV)/(V)?	
Np(115)	Cu_2O	$2.0 \cdot 10^{-13}$	Np(IV)/(V)?	
Np(151)	Viv.[d]	$1.4 \cdot 10^{-13}$		
Np(213)	Mag.[e]	$2.9 \cdot 10^{-13}$		
Np(216)	FF[f]	$1.9 \cdot 10^{-13}$		
Pu(461)	FeO	$<3 \cdot 10^{-16}$	Pu(IV)	$<2 \cdot 10^{-15}$

[a] Contact time (days).

[b] 90% silica sand and 10% bentonite.

[c] D_a probably includes ^{233}Pa (daughter).

[d] Vivianite

[e] Magnetite

[f] Fracture fillings

To investigate this effect further experiments with different contact times would be required. Also for Fe(0) the values are conservative, since in reality no movement have been measured, and the D_a-values are based on the maximum sensivity for the measuring technique. Another advantage with iron is that one would assure that the Tc

or Np that eventually leaches through the bentonite buffer would be in their lower oxidation states, thus giving a very low transport through the surrounding granite in cases where α-radiolysis is negliable.
For plutonium no diffusion can be measured, independent of the addition, indicating that Pu is still in its tetravalent state, and thus not affected by the choice of canister material.

Table 3. Retention of Np, Tc and Pu in the clay barrier.

Nuclide	Halflife (y)	Addition	D_a (m^2/y)	$t_r/t_{½}$ (y)	remaining fraction t_r 0.5 m	remaining fraction $4*t_r$ 1m
^{99}Tc	$2.1\cdot10^5$	Fe(0)	$5.3\cdot10^{-9}$	22.2	$2\cdot10^{-7}$	$<10^{-10}$
		Fe(II)	$1.7\cdot10^{-5}$	$7\cdot10^{-3}$	0.995	0.925
		Cu(0)	$1.4\cdot10^{-4}$	$9\cdot10^{-4}$	0.999	0.991
		Cu(I)	$4.7\cdot10^{-4}$	$3\cdot10^{-4}$	1.000	0.997
^{237}Np	$2.1\cdot10^6$	Fe(0)	$2.9\cdot10^{-8}$	$4\cdot10^{-1}$	0.752	0.011
		Fe(II)	$1.1\cdot10^{-6}$	$1\cdot10^{-2}$	0.993	0.887
		Cu(0)	$5.4\cdot10^{-6}$	$2\cdot10^{-3}$	0.998	0.976
		Cu(I)	$6.3\cdot10^{-6}$	$2\cdot10^{-3}$	0.999	0.979
^{239}Pu	$2.4\cdot10^4$	Fe(II)	$9.5\cdot10^{-9}$	$1\cdot10^2$	$<10^{-10}$	$<10^{-10}$

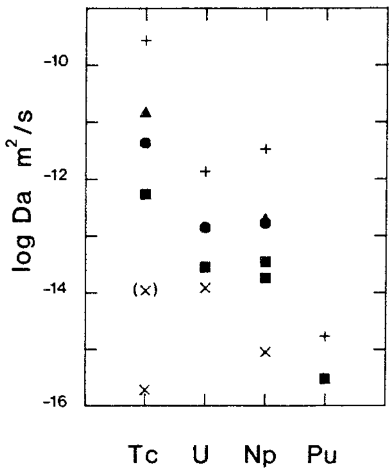

Figure 11. Summary of the apparent diffusivities, D_a, in compacted bentonite with addition of: 1% Fe (x), 1% FeO (■), 1% Cu (●), 1% CuO (▲); 10% bentonite and 90% sand (+).

6 ACKNOWLEDGEMENT

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APPENDIX 1. Listing of diffusion data.

Nuclide	99-Tc
Addition	1% Fe(0)
Detector	Liq. Scint.
Window	350-850
Meas. time	10 m
Background	70.2 cpm
Diff. time	90 d
Cell length	50 mm

Sample no.	Weight	cpm/g HCl	cpm/g HCl+NaBrO3	X mm	LnC
1	0.2812	322.5	3.2	27.95	5.79
2	0.0920	4.3	-42.4	27.62	#NUM!
3	0.1898	31.1	11.6	27.37	3.75
4	0.1356	27.3	-9.6	27.08	2.87
5	0.0492	-63.0	54.9	26.91	#NUM!
6	0.0680	-82.4	-69.1	26.81	#NUM!
7	0.0901	3.3	27.7	26.67	3.44
8	0.1057	106.0	-21.8	26.49	4.43
9	0.1469	5.4	14.3	26.27	2.98
10	0.1012	-52.4	-64.2	26.05	#NUM!
11	0.1153	16.5	-4.3	25.86	2.50
12	0.1151	-16.5	-17.4	25.65	#NUM!
13	0.1118	36.7	-8.1	25.45	3.35
14	0.1313	29.7	-21.3	25.23	2.13
15	0.1171	-2.6	6.8	25.01	1.45
16	0.1237	8.9	-29.9	24.80	#NUM!
17	0.1164	36.9	7.7	24.58	3.80
18	0.1227	35.9	28.5	24.37	4.16
19	0.1270	13.4	22.8	24.15	3.59
20	0.1168	22.3	32.5	23.93	4.00
21	0.1265	20.6	-10.3	23.72	2.33
22	0.1224	29.4	21.2	23.49	3.93
23	0.1289	9.3	-27.2	23.27	#NUM!
24	0.1244	5.6	-49.0	23.04	#NUM!
25	0.2648	29.1	31.0	22.70	4.10
26	0.2130	23.0	5.6	22.27	3.35
27	0.1407	50.5	-13.5	21.96	3.61
28	0.1222	53.2	-14.7	21.72	3.65
29	0.1250	-3.2	-44.8	21.50	#NUM!
30	0.1269	16.5	-4.7	21.28	2.47
31	0.1214	-14.0	3.3	21.06	#NUM!
32	0.1342	14.9	2.2	20.83	2.84
33	0.1202	-6.7	30.0	20.61	3.15
34	0.2341	-5.1	-7.7	20.29	#NUM!
35	0.1273	23.6	-16.5	19.97	1.96
36	0.1190	-8.4	-16.0	19.75	#NUM!
37	0.1358	27.2	-26.5	19.52	-0.31
38	0.1189	9.3	8.4	19.30	2.87
39	0.1296	4.6	-9.3	19.08	#NUM!
40	0.1342	24.6	17.1	18.84	3.73
41	0.1158	-8.6	-27.6	18.62	#NUM!
42	0.1295	-0.8	-40.2	18.40	#NUM!
43	0.1191	39.5	-4.2	18.18	3.56
44	0.1334	-13.5	-27.0	17.95	#NUM!
45	0.1287	46.6	125.9	17.72	5.15

46	0.1189	62.2	-8.4	17.50	3.99
47	0.1317	19.0	4.6	17.28	3.16
48	0.0962	30.1	-31.2	17.07	#NUM!
49	0.1312	80.8	-30.5	16.87	3.92
50	0.1161	71.5	300.6	16.65	5.92
51	0.1219	41.0	30.4	16.44	4.27
52	0.1619	19.1	0.6	16.19	2.98
53	0.1108	33.4	20.8	15.95	3.99
54	0.1122	30.3	10.7	15.75	3.71
55	0.1213	-7.4	25.6	15.54	2.90
56	0.1253	11.2	65.4	15.32	4.34
57	0.1319	22.7	-9.9	15.09	2.56
58	0.1264	28.5	-5.5	14.86	3.13
59	0.1230	14.6	-35.0	14.64	#NUM!
60	0.1224	39.2	-11.4	14.42	3.32
61	0.1287	4.7	19.4	14.20	3.18
62	0.1162	50.8	62.8	13.98	4.73
63	0.1310	55.0	-32.1	13.76	3.13
64	0.1294	3.9	1.5	13.53	1.69
65	0.1273	-18.9	-66.8	13.30	#NUM!
66	0.1083	26.8	0.0	13.09	3.29
67	0.1253	-3.2	-4.8	12.88	#NUM!
68	0.1227	-1.6	-32.6	12.66	#NUM!
69	0.0827	70.1	-41.1	12.48	3.37
70	0.1286	49.8	-41.2	12.29	2.15
71	0.1254	32.7	-5.6	12.06	3.30
72	0.1216	33.7	-14.8	11.84	2.94
73	0.1227	26.1	-43.2	11.63	#NUM!
74	0.1147	-12.2	-20.9	11.42	#NUM!
75	0.1276	-7.8	1.6	11.20	#NUM!
76	0.1314	20.5	-23.6	10.97	#NUM!
77	0.1220	-3.3	3.3	10.74	#NUM!
78	0.1198	-8.3	-20.0	10.53	#NUM!
79	0.1287	0.8	7.8	10.31	2.15
80	0.1276	21.2	-31.3	10.08	#NUM!
81	0.4910	23.0	-2.9	9.53	3.00
82	0.0430	-174.4	-51.2	9.05	#NUM!
83	0.0892	6.7	-46.0	8.94	#NUM!
84	0.1375	-5.1	-42.9	8.73	#NUM!
85	0.1243	-6.4	-34.6	8.50	#NUM!
86	0.1262	-2.4	-34.1	8.28	#NUM!
87	0.1294	23.2	-51.8	8.05	#NUM!
88	0.1299	33.1	3.8	7.82	3.61
89	0.1200	6.7	-63.3	7.60	#NUM!
90	0.1268	29.2	12.6	7.38	3.73
91	0.1221	15.6	-44.2	7.16	#NUM!
92	0.1319	56.1	-16.7	6.93	3.67
93	0.1350	2.2	-34.8	6.69	#NUM!
94	0.1172	16.2	-33.3	6.47	#NUM!
95	0.1241	14.5	-12.1	6.25	0.88
96	0.1189	-17.7	-66.4	6.04	#NUM!
97	0.1477	17.6	-1.4	5.80	2.79
98	0.1133	3.5	-26.5	5.57	#NUM!
99	0.1209	33.9	-12.4	5.36	3.07
100	0.1340	17.2	-28.4	5.13	#NUM!
101	0.1282	23.4	47.6	4.90	4.26
102	0.1209	2.5	-26.5	4.68	#NUM!
103	0.1161	25.0	-20.7	4.47	1.46

104	0.1263	34.8	7.1	4.25	3.74
105	0.1382	-1.4	10.1	4.02	2.16
106	0.1170	6.0	-3.4	3.79	0.94
107	0.1273	49.5	-18.9	3.57	3.42
108	0.1163	54.2	-72.2	3.36	#NUM!
109	0.1382	-7.2	-68.0	3.13	#NUM!
110	0.1272	32.2	-37.7	2.89	#NUM!
111	0.1228	39.9	-16.3	2.67	3.16
112	0.1331	42.1	-27.8	2.44	2.66
113	0.1051	81.8	33.3	2.23	4.75
114	0.1356	35.4	21.4	2.02	4.04
115	0.1361	27.9	6.6	1.78	3.54
116	0.1229	153.0	346.6	1.54	6.21
117	0.5478	39982.7	61383.0	0.95	11.53
118	0.1877	97814.1	130203.5	0.29	12.34
119	0.1377	115385.6	152690.6	0.00	12.50
120	0.1111	68709.3	93588.7	0.22	12.00
121	0.1416	22929.4	31190.7	0.44	10.90
122	0.1134	5085.5	9316.6	0.67	9.58
123	0.1134	1340.4	2000.0	0.87	8.11
124	0.1292	102.2	181.1	1.09	5.65
125	0.1255	10.4	14.3	1.31	3.21
126	0.1205	55.6	22.4	1.53	4.36
127	0.1050	53.3	-27.6	1.73	3.25
128	0.1234	22.7	28.4	1.94	3.93
129	0.1346	84.0	-76.5	2.17	2.01
130	0.0704	25.6	-28.4	2.35	#NUM!
131	0.2441	1.6	9.8	2.63	2.44
132	0.2677	29.9	-0.4	3.08	3.38
133	0.2602	18.1	11.5	3.55	3.39
134	0.2398	19.2	10.0	4.00	3.37
135	0.2939	3.1	-0.3	4.47	1.00
136	0.2018	20.8	5.0	4.91	3.25
137	0.3461	14.7	10.4	5.40	3.22
138	0.1721	43.6	-32.0	5.86	2.45
139	0.2191	22.4	0.5	6.21	3.13
140	0.2328	1.7	-6.4	6.61	#NUM!
141	0.2446	29.8	-9.0	7.04	3.04
142	0.2435	9.0	-9.9	7.47	#NUM!
143	0.2727	11.4	-16.1	7.93	#NUM!
144	0.2239	17.0	4.9	8.37	3.09
145	0.2525	20.2	-2.4	8.80	2.88
146	0.2567	35.4	8.2	9.25	3.78
147	0.2506	16.8	25.1	9.70	3.74
148	0.2513	-14.3	0.8	10.15	#NUM!
149	0.3500	34.9	5.7	10.68	3.70
150	0.1474	0.0	295.1	11.13	5.69
151	0.2042	24.5	-7.3	11.44	2.84
152	0.2406	17.9	-4.6	11.83	2.59
153	0.2539	12.6	-6.3	12.27	1.84
154	0.2422	15.3	-8.3	12.72	1.95
155	0.2693	23.0	-5.2	13.17	2.88
156	0.2433	0.0	-18.1	13.63	#NUM!
157	0.2496	30.4	-10.0	14.07	3.02
158	0.2905	42.3	19.3	14.55	4.12
159	0.4196	15.3	-2.4	15.18	2.55
160	0.3056	34.4	12.1	15.82	3.84
161	0.2118	19.4	-26.0	16.28	#NUM!

162	0.2485	20.1	9.7	16.69	3.39
163	0.2626	55.2	75.0	17.15	4.87
164	0.2503	30.4	22.0	17.60	3.96
165	0.2469	18.6	-9.7	18.05	2.19
166	0.2465	34.9	0.4	18.49	3.56
167	0.3199	24.4	4.7	18.99	3.37
168	0.1967	37.6	29.0	19.45	4.20
169	0.2056	16.5	-14.6	19.81	0.67
170	0.2503	36.4	-3.2	20.21	3.50
171	0.2329	19.8	-11.2	20.64	2.15
172	0.2517	17.1	-23.0	21.07	#NUM!
173	0.2817	41.9	6.0	21	

Nuclide	237-Np	
Addition	1% Fe(II)	as FeO
Detector	Liq. Scint.	Liq. Scint.
	(LS 1d)	(LS 3m)
Window	500-950	500-950
Meas. time	10 m	10 m
Background	64.4 cpm	74.9 cpm
Diff. time:	246 d	
Lenght cell	25 mm	

Sample no.	Weight g	cpm/g LS 1d	cpm/g LS 3m	X mm	LnC LS 1d	LnC LS 3m
1	0.105	-10.5	-33.4	13.72	#NUM!	#NUM!
2	0.127	-0.8	-22.8	13.51	#NUM!	#NUM!
3	0.114	30.7	27.2	13.33	3.42	3.30
4	0.115	-24.3	7.8	13.14	#NUM!	2.06
5	0.123	14.7	-45.7	12.94	2.69	#NUM!
6	0.116	-8.7	-14.7	12.75	#NUM!	#NUM!
7	0.126	11.1	21.5	12.55	2.41	3.07
8	0.116	-25.9	18.1	12.36	#NUM!	2.90
9	0.125	13.6	10.4	12.15	2.61	2.34
10	0.129	12.4	29.5	11.94	2.52	3.39
11	0.117	35.2	-30.0	11.75	3.56	#NUM!
12	0.127	18.1	13.4	11.55	2.90	2.59
13	0.119	31.1	10.1	11.35	3.44	2.31
14	0.122	4.1	-18.8	11.15	1.41	#NUM!
15	0.125	4.0	-18.4	10.95	1.39	#NUM!
16	0.129	-38.0	-23.3	10.74	#NUM!	#NUM!
17	0.127	-10.2	-15.0	10.53	#NUM!	#NUM!
18	0.122	-18.0	26.2	10.33	#NUM!	3.26
19	0.128	25.8	32.8	10.13	3.25	3.49
20	0.123	-13.9	17.1	9.93	#NUM!	2.84
21	0.122	37.6	-27.8	9.73	3.63	#NUM!
22	0.126	-5.6	-11.9	9.52	#NUM!	#NUM!
23	0.122	0.0	0.0	9.32	#NUM!	#NUM!
24	0.129	49.6	30.2	9.11	3.90	3.41
25	0.126	51.8	-4.0	8.91	3.95	#NUM!
26	0.124	12.9	26.5	8.71	2.56	3.28
27	0.125	0.0	-27.2	8.50	#NUM!	#NUM!
28	0.119	32.8	-6.7	8.31	3.49	#NUM!
29	0.131	17.5	29.0	8.10	2.86	3.37
30	0.126	43.8	11.9	7.89	3.78	2.48
31	0.119	-14.3	7.6	7.70	#NUM!	2.03
32	0.118	-6.0	11.9	7.51	#NUM!	2.48
33	0.132	9.9	-26.6	7.29	2.29	#NUM!
34	0.127	40.8	22.0	7.08	3.71	3.09
35	0.131	30.6	0.8	6.87	3.42	-0.27
36	0.117	6.8	-47.9	6.68	1.92	#NUM!
37	0.132	-7.6	-15.2	6.47	#NUM!	#NUM!
38	0.119	33.6	-0.8	6.27	3.51	#NUM!
39	0.127	38.6	44.8	6.06	3.65	3.80
40	0.125	15.2	37.5	5.86	2.72	3.62
41	0.122	15.6	-5.7	5.66	2.75	#NUM!
42	0.122	0.8	3.3	5.46	-0.20	1.19
43	0.124	9.7	30.6	5.26	2.27	3.42
44	0.131	41.9	28.2	5.05	3.74	3.34

45	0.123	-0.8	15.4	4.85	#NUM!	2.74
46	0.120	20.0	-22.4	4.65	2.99	#NUM!
47	0.133	44.3	21.8	4.43	3.79	3.08
48	0.117	18.0	12.0	4.24	2.89	2.48
49	0.131	58.9	39.0	4.03	4.08	3.66
50	0.124	129.6	54.8	3.83	4.86	4.00
51	0.114	86.8	51.7	3.64	4.46	3.95
52	0.132	151.1	123.8	3.43	5.02	4.82
53	0.119	247.9	292.6	3.23	5.51	5.68
54	0.130	312.7	363.7	3.02	5.75	5.90
55	0.123	473.1	542.4	2.82	6.16	6.30
56	0.124	814.6	837.2	2.62	6.70	6.73
57	0.124	1078.3	1219.5	2.42	6.98	7.11
58	0.130	1597.2	1884.3	2.21	7.38	7.54
59	0.127	2055.3	2406.3	2.00	7.63	7.79
60	0.127	2781.9	3308.7	1.80	7.93	8.10
61	0.120	4299.3	4699.8	1.60	8.37	8.46
62	0.126	6533.4	7239.6	1.40	8.78	8.89
63	0.120	9206.7	10265.0	1.20	9.13	9.24
64	0.130	13136.0	14772.5	0.99	9.48	9.60
65	0.121	17100.4	19089.6	0.79	9.75	9.86
66	0.124	19500.8	21642.2	0.59	9.88	9.98
67	0.127	23766.2	26646.9	0.38	10.08	10.19
68	0.177	31898.4	38844.2	0.10	10.37	10.57
69	0.121	34863.9	38973.4	0.10	10.46	10.57
70	0.077	14461.7	15549.9	0.23	9.58	9.65
71	0.119	8856.9	9527.8	0.42	9.09	9.16
72	0.129	7765.9	8788.5	0.63	8.96	9.08
73	0.108	6360.3	6890.4	0.81	8.76	8.84
74	0.124	4673.4	5144.8	1.01	8.45	8.55
75	0.124	3487.1	3818.0	1.21	8.16	8.25
76	0.119	2889.8	2970.6	1.40	7.97	8.00
77	0.131	1840.0	1892.0	1.62	7.52	7.55
78	0.117	1324.2	1486.3	1.81	7.19	7.30
79	0.126	911.3	976.2	2.01	6.81	6.88
80	0.131	593.9	616.8	2.22	6.39	6.42
81	0.118	521.7	492.8	2.42	6.26	6.20
82	0.124	402.7	330.4	2.62	6.00	5.80
83	0.117	230.8	217.1	2.81	5.44	5.38
84	0.124	158.5	167.3	3.01	5.07	5.12
85	0.122	150.8	185.2	3.21	5.02	5.22
86	0.130	123.5	121.1	3.42	4.82	4.80
87	0.126	117.6	34.9	3.63	4.77	3.55
88	0.123	44.1	24.5	3.83	3.79	3.20
89	0.122	44.2	36.8	4.03	3.79	3.61
90	0.116	44.7	23.2	4.22	3.80	3.14
91	0.127	-1.6	25.9	4.42	#NUM!	3.26
92	0.123	53.7	-0.8	4.62	3.98	#NUM!
93	0.113	-7.9	-46.8	4.81	#NUM!	#NUM!
94	0.128	22.7	-12.5	5.02	3.12	#NUM!
95	0.121	18.1	-5.8	5.21	2.90	#NUM!
96	0.129	-5.4	-12.4	5.42	#NUM!	#NUM!
97	0.128	-7.0	-41.5	5.63	#NUM!	#NUM!
98	0.127	25.2	7.9	5.84	3.23	2.07
99	0.125	24.8	-8.0	6.04	3.21	#NUM!
100	0.125	-6.4	-46.5	6.24	#NUM!	#NUM!
101	0.272	-11.4	-2.2	6.69	#NUM!	#NUM!
102	0.228	10.5	-5.7	7.06	2.35	#NUM!

103	0.248	2.4	13.7	7.46	0.89	2.62
104	0.258	-3.5	19.8	7.88	#NUM!	2.98
105	0.251	4.4	-0.4	8.29	1.48	#NUM!
106	0.261	-10.3	-12.3	8.72	#NUM!	#NUM!
107	0.329	8.5	7.3	9.25	2.14	1.99
108	0.713	7.4	-1.7	10.41	2.01	#NUM!
109	0.427	-13.1	-9.8	11.11	#NUM!	#NUM!

Nuclide	237-Np	
Addition	1% Cu(0)	
Detector	Liq. Scint. (LS)	NaI(Tl) (NI)
Window	500-950	0.2-0.4 MeV
Meas. time	10 m	10 m
Background	60.0 cpm	122.6 cpm
Diff. time:	148 d	
Lenght cell	25 mm	

Sample no.	Weight g	cpm/g LS	cpm/g NI	X mm	LnC LS	LnC NI
1	0.078	-47.3	74.2	12.98	#NUM!	4.31
2	0.126	14.3	-41.2	12.77	2.66	#NUM!
3	0.109	-19.3	-3.7	12.60	#NUM!	#NUM!
4	0.112	-5.4	1.8	12.41	#NUM!	0.58
5	0.126	11.1	28.5	12.20	2.40	3.35
6	0.121	17.4	-32.4	12.01	2.86	#NUM!
7	0.119	4.2	-2.5	11.81	1.44	#NUM!
8	0.120	-10.0	-10.0	11.62	#NUM!	#NUM!
9	0.130	9.2	24.6	11.40	2.22	3.20
10	0.124	-4.8	40.3	11.20	#NUM!	3.70
11	0.114	-0.9	-3.5	11.01	#NUM!	#NUM!
12	0.128	16.4	18.8	10.80	2.80	2.93
13	0.130	6.9	-2.3	10.59	1.94	#NUM!
14	0.119	-21.0	-32.7	10.39	#NUM!	#NUM!
15	0.127	-18.1	-5.5	10.18	#NUM!	#NUM!
16	0.117	28.3	-18.9	9.99	3.34	#NUM!
17	0.126	-14.3	-13.5	9.79	#NUM!	#NUM!
18	0.133	-18.1	15.8	9.57	#NUM!	2.76
19	0.129	25.6	0.8	9.36	3.24	-0.25
20	0.133	8.3	-10.6	9.14	2.11	#NUM!
21	0.109	0.0	-48.5	8.96	#NUM!	#NUM!
22	0.128	32.1	50.9	8.75	3.47	3.93
23	0.130	-1.5	-26.9	8.54	#NUM!	#NUM!
24	0.117	-12.8	7.7	8.34	#NUM!	2.04
25	0.118	-4.2	47.5	8.15	#NUM!	3.86
26	0.129	17.0	31.7	7.94	2.83	3.46
27	0.122	22.2	14.0	7.74	3.10	2.64
28	0.129	11.6	-7.8	7.53	2.45	#NUM!
29	0.121	22.3	-43.8	7.33	3.10	#NUM!
30	0.122	-20.5	58.3	7.13	#NUM!	4.07
31	0.122	9.0	-15.5	6.93	2.20	#NUM!
32	0.117	-6.0	24.0	6.74	#NUM!	3.18
33	0.125	38.3	7.2	6.53	3.65	1.97
34	0.126	63.4	-3.2	6.32	4.15	#NUM!
35	0.125	28.7	22.3	6.12	3.36	3.11
36	0.119	84.7	36.9	5.92	4.44	3.61
37	0.126	124.3	-0.8	5.72	4.82	#NUM!
38	0.131	114.1	42.9	5.50	4.74	3.76
39	0.124	137.7	39.7	5.30	4.92	3.68
40	0.119	173.8	41.4	5.10	5.16	3.72
41	0.125	262.6	63.3	4.90	5.57	4.15
42	0.120	406.2	70.9	4.70	6.01	4.26
43	0.126	496.4	179.8	4.50	6.21	5.19

44	0.134	607.3	207.2	4.28	6.41	5.33
45	0.119	730.4	277.2	4.08	6.59	5.62
46	0.123	836.5	350.7	3.88	6.73	5.86
47	0.122	1049.1	427.5	3.68	6.96	6.06
48	0.126	1188.9	524.6	3.47	7.08	6.26
49	0.125	1467.2	588.0	3.27	7.29	6.38
50	0.128	1702.4	734.5	3.06	7.44	6.60
51	0.115	1290.9	681.2	2.87	7.16	6.52
52	0.125	1756.6	930.1	2.66	7.47	6.84
53	0.117	2090.5	1111.9	2.47	7.65	7.01
54	0.133	2193.4	1330.3	2.25	7.69	7.19
55	0.122	2377.9	1336.9	2.05	7.77	7.20
56	0.121	2869.9	1623.0	1.86	7.96	7.39
57	0.120	3348.1	1747.3	1.66	8.12	7.47
58	0.122	3529.8	1997.5	1.46	8.17	7.60
59	0.123	3951.8	2164.1	1.26	8.28	7.68
60	0.127	4011.0	2335.2	1.05	8.30	7.76
61	0.129	5610.1	2786.0	0.84	8.63	7.93
62	0.191	5229.7	2964.9	0.52	8.56	7.99
63	0.176	8601.0	4958.6	0.23	9.06	8.51
64	0.145	10499.7	5623.7	0.00	9.26	8.63
65	0.127	4095.4	2894.3	0.21	8.32	7.97
66	0.099	1150.4	761.9	0.37	7.05	6.64
67	0.138	4867.1	2973.9	0.60	8.49	8.00
68	0.110	3094.3	1674.5	0.78	8.04	7.42
69	0.115	2567.3	1416.2	0.97	7.85	7.26
70	0.117	2379.1	1142.4	1.16	7.77	7.04
71	0.124	1414.2	1055.6	1.37	7.25	6.96
72	0.121	2235.5	893.4	1.56	7.71	6.80
73	0.122	1509.4	819.2	1.76	7.32	6.71
74	0.123	1251.4	676.7	1.96	7.13	6.52
75	0.123	1137.9	564.5	2.17	7.04	6.34
76	0.133	931.0	470.0	2.39	6.84	6.15
77	0.116	855.7	436.4	2.58	6.75	6.08
78	0.124	763.5	355.1	2.78	6.64	5.87
79	0.119	680.9	295.6	2.98	6.52	5.69
80	0.123	505.7	255.3	3.18	6.23	5.54
81	0.128	400.0	192.2	3.39	5.99	5.26
82	0.112	436.8	130.8	3.57	6.08	4.87
83	0.131	290.5	100.9	3.79	5.67	4.61
84	0.122	188.4	71.3	3.99	5.24	4.27
85	0.121	161.8	42.9	4.19	5.09	3.76
86	0.127	123.0	71.8	4.40	4.81	4.27
87	0.124	97.7	30.7	4.60	4.58	3.42
88	0.121	79.5	12.4	4.80	4.38	2.52
89	0.137	45.2	27.0	5.02	3.81	3.29
90	0.134	56.8	34.4	5.24	4.04	3.54
91	0.115	20.0	-6.1	5.43	3.00	#NUM!
92	0.119	51.4	-13.5	5.62	3.94	#NUM!
93	0.121	18.1	-23.1	5.82	2.90	#NUM!
94	0.125	20.8	2.4	6.03	3.04	0.88
95	0.121	43.9	34.8	6.23	3.78	3.55
96	0.126	4.0	4.0	6.43	1.38	1.38
97	0.116	12.0	4.3	6.62	2.49	1.46
98	0.127	-2.4	16.5	6.83	#NUM!	2.80
99	0.116	8.6	-10.3	7.02	2.15	#NUM!
100	0.134	6.7	67.4	7.24	1.91	4.21
101	0.127	14.2	-3.1	7.45	2.65	#NUM!

102	0.119	11.8	-7.6	7.65	2.47	#NUM!
103	0.121	7.4	-16.5	7.85	2.00	#NUM!
104	0.126	27.7	-22.2	8.05	3.32	#NUM!
105	0.121	18.3	-25.7	8.25	2.90	#NUM!
106	0.131	17.6	-38.3	8.47	2.87	#NUM!
107	0.121	59.7	-77.9	8.66	4.09	#NUM!
108	0.118	2.5	11.0	8.86	0.93	2.40
109	0.132	10.6	9.8	9.07	2.36	2.29
110	0.128	29.0	-16.4	9.28	3.37	#NUM!
111	0.127	7.9	45.8	9.49	2.07	3.82
112	0.120	44.1	29.1	9.69	3.79	3.37
113	0.131	9.2	19.9	9.90	2.22	2.99
114	0.297	15.1	-5.7	10.39	2.72	#NUM!
115	0.123	-29.2	23.5	10.59	#NUM!	3.16
116	0.744	15.9	-0.8	11.81	2.76	#NUM!
117	0.046	-93.5	117.4	11.89	#NUM!	4.77

Nuclide	237-Np	
Addition	1% Cu(I)	as Cu2O
Detector	Liq. Scint.	Liq. Scint.
	(LS 1d)	(LS 3m)
Window	500-950	500-950
Meas. time	10 m	10 m
Background	66.8 cpm	74.5 cpm
Diff. time:	115 d	
Lenght cell	25 mm	

Sample no.	Weight g	cpm/g LS 1d	cpm/g LS 3m	X mm	LnC LS 1d	LnC LS 3m
1	0.109	-41.2	-44.9	10.69	#NUM!	#NUM!
2	0.120	-36.8	35.1	10.50	#NUM!	3.56
3	0.130	-14.7	12.3	10.28	#NUM!	2.51
4	0.124	-25.1	-9.7	10.08	#NUM!	#NUM!
5	0.118	-29.7	-16.1	9.89	#NUM!	#NUM!
6	0.122	-9.8	18.8	9.69	#NUM!	2.94
7	0.126	-28.5	11.1	9.48	#NUM!	2.41
8	0.116	-20.6	-39.6	9.29	#NUM!	#NUM!
9	0.120	-50.7	34.9	9.10	#NUM!	3.55
10	0.117	-17.1	-9.4	8.91	#NUM!	#NUM!
11	0.123	-13.0	-4.9	8.71	#NUM!	#NUM!
12	0.121	-9.9	-33.1	8.51	#NUM!	#NUM!
13	0.124	4.9	25.1	8.31	1.58	3.22
14	0.120	-21.6	-36.6	8.11	#NUM!	#NUM!
15	0.125	1.6	47.4	7.91	0.47	3.86
16	0.129	30.2	24.8	7.70	3.41	3.21
17	0.125	7.2	28.9	7.49	1.98	3.36
18	0.122	-16.4	-7.4	7.29	#NUM!	#NUM!
19	0.125	24.8	49.7	7.09	3.21	3.91
20	0.125	6.4	33.7	6.89	1.86	3.52
21	0.126	26.9	77.7	6.68	3.29	4.35
22	0.119	28.6	223.5	6.49	3.35	5.41
23	0.133	72.4	137.3	6.27	4.28	4.92
24	0.115	67.7	143.2	6.08	4.22	4.96
25	0.136	142.6	181.6	5.86	4.96	5.20
26	0.132	157.9	258.9	5.64	5.06	5.56
27	0.120	240.2	437.2	5.45	5.48	6.08
28	0.129	367.8	495.3	5.24	5.91	6.21
29	0.125	427.0	626.0	5.03	6.06	6.44
30	0.118	639.1	906.4	4.84	6.46	6.81
31	0.124	771.5	1194.7	4.64	6.65	7.09
32	0.116	966.4	1423.8	4.45	6.87	7.26
33	0.128	1204.8	1816.3	4.24	7.09	7.50
34	0.121	1643.0	2334.7	4.04	7.40	7.76
35	0.120	1879.3	2673.6	3.85	7.54	7.89
36	0.134	2317.7	3295.4	3.63	7.75	8.10
37	0.117	2655.0	3786.2	3.44	7.88	8.24
38	0.131	3277.7	4431.0	3.22	8.09	8.40
39	0.118	3886.8	4604.7	3.03	8.27	8.43
40	0.124	4439.6	5829.3	2.83	8.40	8.67
41	0.128	5254.1	6767.8	2.62	8.57	8.82
42	0.116	5912.6	7607.3	2.43	8.68	8.94

43	0.130	6402.9	8331.3	2.22	8.76	9.03
44	0.127	7194.5	9056.9	2.01	8.88	9.11
45	0.123	7640.0	11121.6	1.81	8.94	9.32
46	0.128	8198.3	9165.4	1.60	9.01	9.12
47	0.119	9484.4	11502.9	1.41	9.16	9.35
48	0.134	9844.8	12147.8	1.19	9.19	9.40
49	0.117	10800.5	12749.4	1.00	9.29	9.45
50	0.125	11535.6	13465.2	0.79	9.35	9.51
51	0.123	12398.5	14643.7	0.59	9.43	9.59
52	0.121	12316.8	14764.9	0.39	9.42	9.60
53	0.129	12856.1	15278.4	0.18	9.46	9.63
54	0.114	17116.8	15863.9	0.00	9.75	9.67
55	0.116	8100.8	9368.6	0.19	9.00	9.15
56	0.136	6698.0	8600.3	0.41	8.81	9.06
57	0.116	6412.4	8138.3	0.61	8.77	9.00
58	0.126	6157.0	7436.7	0.81	8.73	8.91
59	0.124	5432.6	6968.5	1.01	8.60	8.85
60	0.124	5041.9	6388.7	1.21	8.53	8.76
61	0.130	4278.0	5587.6	1.43	8.36	8.63
62	0.118	3782.2	4847.5	1.62	8.24	8.49
63	0.127	3342.5	4371.7	1.83	8.11	8.38
64	0.121	2877.3	3730.6	2.03	7.96	8.22
65	0.122	2357.4	3197.5	2.23	7.77	8.07
66	0.127	2082.8	2739.0	2.43	7.64	7.92
67	0.126	1788.8	2454.2	2.64	7.49	7.81
68	0.122	1458.3	2099.7	2.84	7.29	7.65
69	0.128	1171.6	1603.0	3.05	7.07	7.38
70	0.125	1001.6	1309.4	3.25	6.91	7.18
71	0.124	788.4	1145.4	3.45	6.67	7.04
72	0.126	634.6	917.4	3.66	6.45	6.82
73	0.121	456.9	679.1	3.86	6.12	6.52
74	0.128	421.2	539.0	4.07	6.04	6.29
75	0.124	269.6	381.0	4.27	5.60	5.94
76	0.132	239.4	285.7	4.48	5.48	5.65
77	0.122	167.4	164.9	4.68	5.12	5.11
78	0.122	138.3	162.0	4.88	4.93	5.09
79	0.126	55.7	81.1	5.09	4.02	4.40
80	0.125	85.1	40.1	5.29	4.44	3.69
81	0.124	-11.3	63.8	5.49	#NUM!	4.16
82	0.122	54.8	11.4	5.69	4.00	2.44
83	0.121	12.4	12.4	5.89	2.52	2.52
84	0.124	27.5	26.7	6.09	3.31	3.28
85	0.128	28.1	0.8	6.30	3.34	-0.25
86	0.128	12.5	-22.0	6.51	2.53	#NUM!
87	0.126	42.9	-19.9	6.71	3.76	#NUM!
88	0.122	2.5	-42.8	6.91	0.90	#NUM!
89	0.124	-7.2	0.0	7.12	#NUM!	#NUM!
90	0.124	-16.1	-14.5	7.32	#NUM!	#NUM!
91	0.128	38.2	32.0	7.53	3.64	3.46
92	0.123	-13.9	-15.5	7.73	#NUM!	#NUM!
93	0.122	23.0	-4.9	7.93	3.13	#NUM!
94	0.130	20.0	-17.7	8.14	3.00	#NUM!
95	0.124	18.6	14.5	8.34	2.92	2.68
96	0.126	50.9	24.7	8.55	3.93	3.21
97	0.124	24.3	-21.0	8.75	3.19	#NUM!
98	0.123	26.0	-25.2	8.95	3.26	#NUM!
99	0.127	4.7	-21.2	9.16	1.55	#NUM!
100	0.123	-25.2	23.6	9.36	#NUM!	3.16

101	0.132	31.7	5.3	9.58	3.46	1.67
102	0.122	27.2	-3.3	9.77	3.30	#NUM!
103	0.124	27.5	11.3	9.98	3.31	2.43
104	0.134	-6.7	18.7	10.19	#NUM!	2.93
105	0.129	31.1	20.2	10.40	3.44	3.01
106	0.137	33.7	40.3	10.63	3.52	3.70
107	0.129	-7.0	-42.6	10.84	#NUM!	#NUM!
108	0.129	15.5	36.4	11.05	2.74	3.59
109	0.132	52.9	-46.9	11.27	3.97	#NUM!
110	0.127	6.3	-15.8	11.47	1.84	#NUM!
111	0.425	24.0	30.8	12.17	3.18	3.43
112	0.897	26.0	42.6	13.63	3.26	3.75
113	0.305	31.8	22.3	14.13	3.46	3.11

Nuclide 237-Np
Addition 1% magnetite

Detector	Liq. Scint. (LS)	NaI(Tl) (NI)
Window	400-950	0.2-0.4 MeV
Meas. time	10 m	10 m
Background	61.2 cpm	124.0 cpm

Diff. time: 213 d
Lenght cell 25 mm

Sample no.	Weight g	cpm/g LS	cpm/g NI	X mm	LnC LS	LnC NI
1	0.130	-6.9	53.9	13.46	#NUM!	3.99
2	0.106	-17.9	-37.6	13.28	#NUM!	#NUM!
3	0.120	33.4	25.1	13.08	3.51	3.22
4	0.131	-0.8	7.6	12.86	#NUM!	2.03
5	0.122	-4.1	41.0	12.66	#NUM!	3.71
6	0.119	5.0	-42.0	12.46	1.62	#NUM!
7	0.134	0.7	0.0	12.24	-0.29	#NUM!
8	0.120	-12.5	-8.4	12.05	#NUM!	#NUM!
9	0.136	-1.5	0.0	11.82	#NUM!	#NUM!
10	0.123	-8.1	8.1	11.62	#NUM!	2.10
11	0.104	18.4	9.7	11.44	2.91	2.27
12	0.138	2.2	14.5	11.22	0.77	2.67
13	0.121	751.7	16.6	11.02	6.62	2.81
14	0.127	50.4	55.2	10.80	3.92	4.01
15	0.136	47.7	58.7	10.58	3.86	4.07
16	0.112	49.1	17.9	10.39	3.89	2.88
17	0.139	78.7	36.1	10.16	4.37	3.59
18	0.113	83.8	26.5	9.98	4.43	3.28
19	0.139	124.3	21.6	9.75	4.82	3.07
20	0.125	138.5	64.1	9.54	4.93	4.16
21	0.122	143.1	57.6	9.34	4.96	4.05
22	0.139	215.2	93.9	9.11	5.37	4.54
23	0.117	251.7	128.0	8.91	5.53	4.85
24	0.132	241.3	151.3	8.70	5.49	5.02
25	0.129	324.8	155.0	8.48	5.78	5.04
26	0.122	390.7	139.2	8.28	5.97	4.94
27	0.129	478.3	286.4	8.07	6.17	5.66
28	0.126	578.8	230.9	7.86	6.36	5.44
29	0.133	659.4	286.4	7.64	6.49	5.66
30	0.132	799.5	423.6	7.42	6.68	6.05
31	0.125	944.1	479.2	7.21	6.85	6.17
32	0.132	1081.9	545.9	6.99	6.99	6.30
33	0.123	1208.2	734.7	6.79	7.10	6.60
34	0.136	1451.7	730.6	6.57	7.28	6.59
35	0.117	1506.0	766.6	6.37	7.32	6.64
36	0.127	1773.4	928.4	6.16	7.48	6.83
37	0.138	1869.8	1098.2	5.93	7.53	7.00
38	0.130	2214.9	1158.9	5.72	7.70	7.06
39	0.134	2401.0	1329.4	5.49	7.78	7.19
40	0.121	2712.9	1444.0	5.30	7.91	7.28
41	0.111	3090.3	1669.7	5.11	8.04	7.42
42	0.141	3197.6	1869.7	4.88	8.07	7.53
43	0.126	3509.1	2058.6	4.67	8.16	7.63
44	0.153	4372.3	2279.6	4.42	8.38	7.73

45	0.119	4148.7	2411.8	4.22	8.33	7.79
46	0.118	4292.1	2497.9	4.02	8.36	7.82
47	0.143	4644.5	2966.3	3.79	8.44	8.00
48	0.121	5133.1	3239.7	3.59	8.54	8.08
49	0.153	5516.3	3431.4	3.33	8.62	8.14
50	0.120	6075.6	3616.0	3.13	8.71	8.19
51	0.124	6546.9	4045.3	2.93	8.79	8.31
52	0.123	6917.0	4369.4	2.72	8.84	8.38
53	0.160	6589.0	4342.1	2.46	8.79	8.38
54	0.112	7440.8	4977.7	2.27	8.91	8.51
55	0.138	7854.3	5224.6	2.05	8.97	8.56
56	0.034	6961.9	4604.1	1.99	8.85	8.43
57	0.069	8723.4	5938.9	1.88	9.07	8.69
58	0.222	9121.0	6108.4	1.51	9.12	8.72
59	0.194	9508.2	6872.4	1.19	9.16	8.84
60	0.085	11317.2	7349.1	1.05	9.33	8.90
61	0.141	10956.6	7466.2	0.81	9.30	8.92
62	0.123	10806.7	7251.2	0.61	9.29	8.89
63	0.291	22652.4	20185.3	0.13	10.03	9.91
64	0.061	63903.6	51535.9	0.03	11.07	10.85
65	0.041	60369.6	53792.3	0.04	11.01	10.89
66	0.113	38866.9	33327.4	0.23	10.57	10.41
67	0.113	6786.7	4566.4	0.42	8.82	8.43
68	0.139	6288.5	4201.4	0.65	8.75	8.34
69	0.127	6474.4	4240.8	0.86	8.78	8.35
70	0.127	5798.0	3671.4	1.07	8.67	8.21
71	0.109	5135.8	3348.6	1.25	8.54	8.12
72	0.139	4983.5	3160.9	1.48	8.51	8.06
73	0.120	4804.2	3012.6	1.68	8.48	8.01
74	0.145	4328.7	2645.0	1.92	8.37	7.88
75	0.107	4310.1	2672.3	2.09	8.37	7.89
76	0.135	4101.6	2327.7	2.32	8.32	7.75
77	0.140	3706.3	2098.9	2.55	8.22	7.65
78	0.100	3172.5	1884.3	2.71	8.06	7.54
79	0.161	2893.6	1736.2	2.98	7.97	7.46
80	0.277	2241.9	1402.3	3.44	7.72	7.25
81	0.274	2130.3	1259.1	3.89	7.66	7.14
82	0.188	1830.9	997.3	4.20	7.51	6.91
83	0.279	1375.4	805.3	4.67	7.23	6.69
84	0.259	1127.2	398.1	5.10	7.03	5.99
85	0.239	865.3	435.1	5.49	6.76	6.08
86	0.296	604.7	324.3	5.98	6.40	5.78
87	0.248	461.0	225.4	6.39	6.13	5.42
88	0.284	303.1	148.0	6.86	5.71	5.00
89	0.195	249.2	117.7	7.19	5.52	4.77
90	0.196	176.7	50.9	7.51	5.17	3.93
91	0.295	94.3	44.1	8.00	4.55	3.79
92	0.116	54.5	43.3	8.19	4.00	3.77
93	0.588	27.9	35.7	9.17	3.33	3.58
94	0.031	-22.6	-32.3	9.22	#NUM!	#NUM!
95	0.298	20.8	13.4	9.71	3.03	2.60
96	0.520	9.6	3.8	10.57	2.26	1.35
97	0.457	-14.2	13.1	11.33	#NUM!	2.57

Nuclide 237-Np
Addition 1% Vivianite
Detector Liq. Scint. (LS) NaI(Tl) (NI)
Window 400-950 0.2-0.4 MeV
Meas. time 10 m 10 m
Background 64.5 cpm 121.6 cpm
Diff. time: 151 d
Lenght cell 25 mm

Sample no.	Weight g	cpm/g LS	cpm/g NI	X mm	LnC LS	LnC NI
1	0.138	36.2	44.2	12.33	3.59	3.790
2	0.123	10.5	0.8	12.12	2.35	-0.207
3	0.123	5.6	-52.8	11.92	1.72	#NUM!
4	0.112	-18.9	-6.3	11.73	#NUM!	#NUM!
5	0.120	13.3	-3.3	11.53	2.59	#NUM!
6	0.120	-7.6	29.3	11.33	#NUM!	3.376
7	0.121	23.1	0.0	11.12	3.14	#NUM!
8	0.124	-33.1	-11.3	10.92	#NUM!	#NUM!
9	0.119	9.2	-14.3	10.72	2.22	#NUM!
10	0.119	9.2	8.4	10.52	2.22	2.131
11	0.114	-11.5	52.8	10.33	#NUM!	3.967
12	0.122	-23.1	18.9	10.12	#NUM!	2.939
13	0.124	21.0	10.5	9.92	3.04	2.354
14	0.123	-45.6	-22.0	9.71	#NUM!	#NUM!
15	0.127	6.2	-45.6	9.50	1.83	#NUM!
16	0.129	5.3	-25.5	9.28	1.67	#NUM!
17	0.118	-12.0	30.6	9.08	#NUM!	3.422
18	0.115	-33.2	-40.0	8.89	#NUM!	#NUM!
19	0.120	27.5	-23.4	8.69	3.31	#NUM!
20	0.115	15.5	-52.0	8.49	2.74	#NUM!
21	0.125	-6.5	2.4	8.28	#NUM!	0.872
22	0.120	-5.9	12.5	8.08	#NUM!	2.526
23	0.120	-38.5	59.3	7.88	#NUM!	4.082
24	0.120	-17.6	32.4	7.68	#NUM!	3.480
25	0.124	-10.6	12.9	7.47	#NUM!	2.559
26	0.131	23.5	-15.2	7.25	3.16	#NUM!
27	0.120	5.8	50.1	7.05	1.75	3.914
28	0.121	-35.7	-2.5	6.85	#NUM!	#NUM!
29	0.123	23.5	18.7	6.64	3.16	2.930
30	0.116	6.8	46.7	6.45	1.92	3.844
31	0.128	44.4	17.2	6.23	3.79	2.843
32	0.116	31.7	12.9	6.04	3.46	2.557
33	0.119	27.7	23.5	5.84	3.32	3.159
34	0.126	34.2	28.7	5.63	3.53	3.356
35	0.123	60.1	7.3	5.42	4.10	1.991
36	0.129	117.8	39.5	5.20	4.77	3.677
37	0.120	104.7	96.4	5.00	4.65	4.569
38	0.127	155.8	51.2	4.79	5.05	3.935
39	0.118	214.1	61.0	4.59	5.37	4.110
40	0.120	270.4	157.8	4.39	5.60	5.061

41	0.129	290.7	136.1	4.17	5.67	4.914
42	0.115	409.3	237.8	3.98	6.01	5.471
43	0.128	469.4	270.0	3.77	6.15	5.598
44	0.115	615.6	322.3	3.57	6.42	5.775
45	0.105	788.1	419.8	3.40	6.67	6.040
46	0.125	846.4	569.1	3.19	6.74	6.344
47	0.125	1130.7	689.8	2.98	7.03	6.536
48	0.119	1286.8	734.1	2.78	7.16	6.599
49	0.124	1603.0	920.3	2.57	7.38	6.825
50	0.119	1998.2	1078.2	2.37	7.60	6.983
51	0.134	2149.5	1258.0	2.14	7.67	7.137
52	0.126	2867.6	1572.1	1.93	7.96	7.360
53	0.610	9118.9	8533.2	0.91	9.12	9.052
54	0.426	24967.1	24262.0	0.19	10.13	10.097
55	0.115	29230.3	22481.7	0.00	10.28	10.020
56	0.119	27166.0	15882.8	0.20	10.21	9.673
57	0.123	23839.9	12906.1	0.40	10.08	9.465
58	0.114	23334.1	12345.6	0.60	10.06	9.421
59	0.131	19536.7	11013.8	0.82	9.88	9.307
60	0.124	14353.4	8301.9	1.02	9.57	9.024
61	0.116	13639.2	7863.3	1.22	9.52	8.970
62	0.127	12679.7	7313.1	1.43	9.45	8.897
63	0.119	11377.7	6866.8	1.63	9.34	8.834
64	0.134	10153.5	6203.7	1.85	9.23	8.733
65	0.115	8732.5	5524.4	2.05	9.07	8.617
66	0.122	7919.3	4792.6	2.25	8.98	8.475
67	0.123	6265.6	3771.7	2.46	8.74	8.235
68	0.123	6049.4	3825.0	2.66	8.71	8.249
69	0.123	5008.9	3171.4	2.87	8.52	8.062
70	0.121	4096.6	2476.9	3.07	8.32	7.815
71	0.118	3983.8	2472.8	3.27	8.29	7.813
72	0.131	2884.2	1807.7	3.49	7.97	7.500
73	0.118	2896.7	1761.4	3.69	7.97	7.474
74	0.129	2156.0	1313.7	3.90	7.68	7.181
75	0.114	1756.7	1144.0	4.09	7.47	7.042
76	0.130	1543.1	986.1	4.31	7.34	6.894
77	0.119	1230.7	824.8	4.51	7.12	6.715
78	0.127	1085.2	603.0	4.72	6.99	6.402
79	0.135	828.4	442.5	4.95	6.72	6.092
80	0.118	603.3	345.5	5.15	6.40	5.845
81	0.118	481.7	338.7	5.35	6.18	5.825
82	0.132	439.2	264.8	5.57	6.09	5.579
83	0.117	305.4	182.6	5.76	5.72	5.207
84	0.123	294.1	135.3	5.97	5.68	4.907
85	0.116	108.6	52.6	6.16	4.69	3.963
86	0.257	141.9	66.1	6.60	4.95	4.191
87	0.251	48.7	47.9	7.02	3.89	3.869
88	0.237	47.6	43.0	7.41	3.86	3.761
89	0.210	14.3	19.0	7.77	2.66	2.946
90	0.240	17.9	4.6	8.17	2.88	1.521
91	0.245	2.4	1.2	8.58	0.90	0.203
92	0.256	-8.6	-2.0	9.01	#NUM!	#NUM!
93	0.269	5.6	-5.6	9.46	1.72	#NUM!
94	0.257	-7.4	0.4	9.90	#NUM!	-0.945
95	0.279	-1.4	4.3	10.36	#NUM!	1.457
96	0.317	9.1	-17.3	10.90	2.21	#NUM!
97	0.370	3.5	18.7	11.52	1.25	2.927
98	0.550	37.1	-1.3	12.44	3.61	#NUM!

Nuclide	237-Np	
Addition	1% fracture fillings	
Detector	Liq. Scint. (LS)	NaI(Tl) (NI)
Window	400-950	0.2-0.4 MeV
Meas. time	10 m	10 m
Background	64.8 cpm	125.1 cpm
Diff. time:	216 d	
Lenght cell	25 mm	

Sample no.	Weight g	cpm/g LS	cpm/g NI	X mm	LnC LS	LnC NI
1	0.201	86.8	-78.3	12.30	4.46	#NUM!
2	0.110	36.4	-10.0	12.03	3.59	#NUM!
3	0.115	9.6	60.0	11.85	2.26	4.09
4	0.131	21.4	83.3	11.65	3.06	4.42
5	0.125	-8.8	-16.9	11.46	#NUM!	#NUM!
6	0.119	44.4	-34.4	11.28	3.79	#NUM!
7	0.142	-25.4	-7.8	11.06	#NUM!	#NUM!
8	0.111	30.7	-19.0	10.90	3.43	#NUM!
9	0.128	-28.2	-16.4	10.70	#NUM!	#NUM!
10	0.119	-38.7	-42.9	10.52	#NUM!	#NUM!
11	0.122	-34.4	-41.8	10.33	#NUM!	#NUM!
12	0.128	-51.8	-0.8	10.14	#NUM!	#NUM!
13	0.124	4.0	7.3	9.95	1.40	1.99
14	0.128	13.3	-0.8	9.76	2.59	#NUM!
15	0.126	-45.3	-0.8	9.56	#NUM!	#NUM!
16	0.075	-100.0	-41.3	9.45	#NUM!	#NUM!
17	0.141	10.6	-7.8	9.24	2.36	#NUM!
18	0.160	-0.6	11.9	8.99	#NUM!	2.48
19	0.123	-15.5	-25.3	8.80	#NUM!	#NUM!
20	0.123	51.9	-25.2	8.62	3.95	#NUM!
21	0.131	28.2	-0.8	8.42	3.34	#NUM!
22	0.130	40.9	-8.5	8.22	3.71	#NUM!
23	0.119	38.5	49.4	8.04	3.65	3.90
24	0.129	29.5	53.6	7.84	3.38	3.98
25	0.126	66.8	46.9	7.65	4.20	3.85
26	0.131	65.1	121.8	7.45	4.18	4.80
27	0.124	134.5	87.8	7.26	4.90	4.47
28	0.129	115.6	115.6	7.07	4.75	4.75
29	0.123	162.9	161.3	6.88	5.09	5.08
30	0.123	194.1	129.7	6.69	5.27	4.87
31	0.129	271.4	178.1	6.50	5.60	5.18
32	0.111	304.2	143.1	6.33	5.72	4.96
33	0.148	-289.1	236.3	6.10	#NUM!	5.47
34	0.127	451.2	243.3	5.91	6.11	5.49
35	0.133	504.1	366.8	5.70	6.22	5.90
36	0.125	545.5	318.2	5.51	6.30	5.76

37	0.129	626.4	332.6	5.32	6.44	5.81
38	0.091	764.8	403.7	5.18	6.64	6.00
39	0.151	856.5	497.7	4.95	6.75	6.21
40	0.133	934.6	540.6	4.75	6.84	6.29
41	0.126	1027.0	617.8	4.55	6.93	6.43
42	0.125	1156.3	661.1	4.36	7.05	6.49
43	0.123	1225.8	730.3	4.17	7.11	6.59
44	0.125	1497.2	919.9	3.98	7.31	6.82
45	0.133	1495.9	855.7	3.78	7.31	6.75
46	0.130	1660.2	964.5	3.58	7.41	6.87
47	0.130	1730.1	1095.9	3.39	7.46	7.00
48	0.117	2118.8	1341.0	3.21	7.66	7.20
49	0.140	2070.9	1395.1	2.99	7.64	7.24
50	0.122	2447.1	1434.8	2.81	7.80	7.27
51	0.129	2575.8	1561.0	2.61	7.85	7.35
52	0.112	2728.7	1753.8	2.44	7.91	7.47
53	0.134	2874.4	1860.2	2.24	7.96	7.53
54	0.128	3192.5	1947.6	2.04	8.07	7.57
55	0.071	3745.8	2484.6	1.94	8.23	7.82
56	0.197	3297.4	2256.7	1.64	8.10	7.72
57	0.119	3793.2	2463.3	1.46	8.24	7.81
58	0.132	4065.1	2709.3	1.25	8.31	7.90
59	0.119	4391.6	2784.0	1.07	8.39	7.93
60	0.105	5251.0	3307.0	0.91	8.57	8.10
61	0.133	4556.5	3380.3	0.71	8.42	8.13
62	0.127	9504.7	8044.7	0.52	9.16	8.99
63	0.237	9677.9	8059.6	0.16	9.18	8.99
64	0.058	90060.0	71147.5	0.07	11.41	11.17
65	0.079	114929.5	94079.3	0.05	11.65	11.45
66	0.126	38512.7	31398.3	0.25	10.56	10.35
67	0.120	9149.3	6754.8	0.43	9.12	8.82
68	0.129	8198.1	5781.0	0.62	9.01	8.66
69	0.151	8824.9	6020.5	0.86	9.09	8.70
70	0.113	7625.1	5330.7	1.03	8.94	8.58
71	0.125	7358.9	5035.2	1.22	8.90	8.52
72	0.131	7147.8	5037.5	1.42	8.87	8.52
73	0.133	7072.3	4746.8	1.62	8.86	8.47
74	0.132	6440.7	4390.8	1.82	8.77	8.39
75	0.119	5961.4	4173.5	2.00	8.69	8.34
76	0.129	6114.8	3715.3	2.20	8.72	8.22
77	0.137	5016.0	3636.3	2.41	8.52	8.20
78	0.147	5405.0	3559.6	2.63	8.60	8.18
79	0.110	5074.6	3211.1	2.80	8.53	8.07
80	0.121	4487.6	4628.5	2.98	8.41	8.44
81	0.117	4234.6	2807.4	3.16	8.35	7.94
82	0.140	3950.0	2635.0	3.38	8.28	7.88
83	0.224	2462.2	1658.0	3.72	7.81	7.41
84	0.173	2740.5	1843.4	3.98	7.92	7.52
85	0.102	4525.1	2999.0	4.13	8.42	8.01
86	0.222	2771.1	1308.8	4.47	7.93	7.18
87	0.231	2058.1	1659.7	4.82	7.63	7.41
88	0.176	1869.9	1709.7	5.09	7.53	7.44
89	0.380	1552.0	502.5	5.67	7.35	6.22
90	0.187	1302.8	1754.4	5.96	7.17	7.47
91	0.299	822.3	460.7	6.41	6.71	6.13
92	0.313	662.6	468.9	6.89	6.50	6.15
93	0.262	480.2	437.9	7.29	6.17	6.08
94	0.236	377.0	275.2	7.65	5.93	5.62

95	0.250	213.0	127.5	8.03	5.36	4.85
96	0.284	176.3	70.2	8.46	5.17	4.25
97	0.211	117.8	61.0	8.78	4.77	4.11
98	0.281	57.3	24.6	9.21	4.05	3.20
99	0.245	34.3	24.1	9.58	3.54	3.18
100	0.243	40.3	20.1	9.95	3.70	3.00
101	0.419	-3.1	21.2	10.59	#NUM!	3.06
102	0.112	11.6	-4185.0	10.76	2.45	#NUM!
103	0.407	-16.0	-1168.0	11.39	#NUM!	#NUM!
104	0.106	27.5	-4471.0	11.55	3.31	#NUM!
105	0.626	-21.1	-755.0	12.50	#NUM!	#NUM!

Nuclide 99-Tc
Addition 1% Fe(0)
Detector Liq. Scint.
Window 350-850
Meas. time 10 m
Background 70.2 cpm
Diff. time 90 d
Cell length 50 mm

Sample no.	Weight	cpm/g HCl	cpm/g HCl+NaBrO3	X mm	LnC
1	0.2812	322.5	3.2	27.95	5.79
2	0.0920	4.3	-42.4	27.62	#NUM!
3	0.1898	31.1	11.6	27.37	3.75
4	0.1356	27.3	-9.6	27.08	2.87
5	0.0492	-63.0	54.9	26.91	#NUM!
6	0.0680	-82.4	-69.1	26.81	#NUM!
7	0.0901	3.3	27.7	26.67	3.44
8	0.1057	106.0	-21.8	26.49	4.43
9	0.1469	5.4	14.3	26.27	2.98
10	0.1012	-52.4	-64.2	26.05	#NUM!
11	0.1153	16.5	-4.3	25.86	2.50
12	0.1151	-16.5	-17.4	25.65	#NUM!
13	0.1118	36.7	-8.1	25.45	3.35
14	0.1313	29.7	-21.3	25.23	2.13
15	0.1171	-2.6	6.8	25.01	1.45
16	0.1237	8.9	-29.9	24.80	#NUM!
17	0.1164	36.9	7.7	24.58	3.80
18	0.1227	35.9	28.5	24.37	4.16
19	0.1270	13.4	22.8	24.15	3.59
20	0.1168	22.3	32.5	23.93	4.00
21	0.1265	20.6	-10.3	23.72	2.33
22	0.1224	29.4	21.2	23.49	3.93
23	0.1289	9.3	-27.2	23.27	#NUM!
24	0.1244	5.6	-49.0	23.04	#NUM!
25	0.2648	29.1	31.0	22.70	4.10
26	0.2130	23.0	5.6	22.27	3.35
27	0.1407	50.5	-13.5	21.96	3.61
28	0.1222	53.2	-14.7	21.72	3.65
29	0.1250	-3.2	-44.8	21.50	#NUM!
30	0.1269	16.5	-4.7	21.28	2.47
31	0.1214	-14.0	3.3	21.06	#NUM!
32	0.1342	14.9	2.2	20.83	2.84
33	0.1202	-6.7	30.0	20.61	3.15
34	0.2341	-5.1	-7.7	20.29	#NUM!
35	0.1273	23.6	-16.5	19.97	1.96
36	0.1190	-8.4	-16.0	19.75	#NUM!
37	0.1358	27.2	-26.5	19.52	-0.31
38	0.1189	9.3	8.4	19.30	2.87
39	0.1296	4.6	-9.3	19.08	#NUM!
40	0.1342	24.6	17.1	18.84	3.73
41	0.1158	-8.6	-27.6	18.62	#NUM!
42	0.1295	-0.8	-40.2	18.40	#NUM!
43	0.1191	39.5	-4.2	18.18	3.56
44	0.1334	-13.5	-27.0	17.95	#NUM!
45	0.1287	46.6	125.9	17.72	5.15

46	0.1189	62.2	-8.4	17.50	3.99
47	0.1317	19.0	4.6	17.28	3.16
48	0.0962	30.1	-31.2	17.07	#NUM!
49	0.1312	80.8	-30.5	16.87	3.92
50	0.1161	71.5	300.6	16.65	5.92
51	0.1219	41.0	30.4	16.44	4.27
52	0.1619	19.1	0.6	16.19	2.98
53	0.1108	33.4	20.8	15.95	3.99
54	0.1122	30.3	10.7	15.75	3.71
55	0.1213	-7.4	25.6	15.54	2.90
56	0.1253	11.2	65.4	15.32	4.34
57	0.1319	22.7	-9.9	15.09	2.56
58	0.1264	28.5	-5.5	14.86	3.13
59	0.1230	14.6	-35.0	14.64	#NUM!
60	0.1224	39.2	-11.4	14.42	3.32
61	0.1287	4.7	19.4	14.20	3.18
62	0.1162	50.8	62.8	13.98	4.73
63	0.1310	55.0	-32.1	13.76	3.13
64	0.1294	3.9	1.5	13.53	1.69
65	0.1273	-18.9	-66.8	13.30	#NUM!
66	0.1083	26.8	0.0	13.09	3.29
67	0.1253	-3.2	-4.8	12.88	#NUM!
68	0.1227	-1.6	-32.6	12.66	#NUM!
69	0.0827	70.1	-41.1	12.48	3.37
70	0.1286	49.8	-41.2	12.29	2.15
71	0.1254	32.7	-5.6	12.06	3.30
72	0.1216	33.7	-14.8	11.84	2.94
73	0.1227	26.1	-43.2	11.63	#NUM!
74	0.1147	-12.2	-20.9	11.42	#NUM!
75	0.1276	-7.8	1.6	11.20	#NUM!
76	0.1314	20.5	-23.6	10.97	#NUM!
77	0.1220	-3.3	3.3	10.74	#NUM!
78	0.1198	-8.3	-20.0	10.53	#NUM!
79	0.1287	0.8	7.8	10.31	2.15
80	0.1276	21.2	-31.3	10.08	#NUM!
81	0.4910	23.0	-2.9	9.53	3.00
82	0.0430	-174.4	-51.2	9.05	#NUM!
83	0.0892	6.7	-46.0	8.94	#NUM!
84	0.1375	-5.1	-42.9	8.73	#NUM!
85	0.1243	-6.4	-34.6	8.50	#NUM!
86	0.1262	-2.4	-34.1	8.28	#NUM!
87	0.1294	23.2	-51.8	8.05	#NUM!
88	0.1299	33.1	3.8	7.82	3.61
89	0.1200	6.7	-63.3	7.60	#NUM!
90	0.1268	29.2	12.6	7.38	3.73
91	0.1221	15.6	-44.2	7.16	#NUM!
92	0.1319	56.1	-16.7	6.93	3.67
93	0.1350	2.2	-34.8	6.69	#NUM!
94	0.1172	16.2	-33.3	6.47	#NUM!
95	0.1241	14.5	-12.1	6.25	0.88
96	0.1189	-17.7	-66.4	6.04	#NUM!
97	0.1477	17.6	-1.4	5.80	2.79
98	0.1133	3.5	-26.5	5.57	#NUM!
99	0.1209	33.9	-12.4	5.36	3.07
100	0.1340	17.2	-28.4	5.13	#NUM!
101	0.1282	23.4	47.6	4.90	4.26
102	0.1209	2.5	-26.5	4.68	#NUM!
103	0.1161	25.0	-20.7	4.47	1.46

104	0.1263	34.8	7.1	4.25	3.74
105	0.1382	-1.4	10.1	4.02	2.16
106	0.1170	6.0	-3.4	3.79	0.94
107	0.1273	49.5	-18.9	3.57	3.42
108	0.1163	54.2	-72.2	3.36	#NUM!
109	0.1382	-7.2	-68.0	3.13	#NUM!
110	0.1272	32.2	-37.7	2.89	#NUM!
111	0.1228	39.9	-16.3	2.67	3.16
112	0.1331	42.1	-27.8	2.44	2.66
113	0.1051	81.8	33.3	2.23	4.75
114	0.1356	35.4	21.4	2.02	4.04
115	0.1361	27.9	6.6	1.78	3.54
116	0.1229	153.0	346.6	1.54	6.21
117	0.5478	39982.7	61383.0	0.95	11.53
118	0.1877	97814.1	130203.5	0.29	12.34
119	0.1377	115385.6	152690.6	0.00	12.50
120	0.1111	68709.3	93588.7	0.22	12.00
121	0.1416	22929.4	31190.7	0.44	10.90
122	0.1134	5085.5	9316.6	0.67	9.58
123	0.1134	1340.4	2000.0	0.87	8.11
124	0.1292	102.2	181.1	1.09	5.65
125	0.1255	10.4	14.3	1.31	3.21
126	0.1205	55.6	22.4	1.53	4.36
127	0.1050	53.3	-27.6	1.73	3.25
128	0.1234	22.7	28.4	1.94	3.93
129	0.1346	84.0	-76.5	2.17	2.01
130	0.0704	25.6	-28.4	2.35	#NUM!
131	0.2441	1.6	9.8	2.63	2.44
132	0.2677	29.9	-0.4	3.08	3.38
133	0.2602	18.1	11.5	3.55	3.39
134	0.2398	19.2	10.0	4.00	3.37
135	0.2939	3.1	-0.3	4.47	1.00
136	0.2018	20.8	5.0	4.91	3.25
137	0.3461	14.7	10.4	5.40	3.22
138	0.1721	43.6	-32.0	5.86	2.45
139	0.2191	22.4	0.5	6.21	3.13
140	0.2328	1.7	-6.4	6.61	#NUM!
141	0.2446	29.8	-9.0	7.04	3.04
142	0.2435	9.0	-9.9	7.47	#NUM!
143	0.2727	11.4	-16.1	7.93	#NUM!
144	0.2239	17.0	4.9	8.37	3.09
145	0.2525	20.2	-2.4	8.80	2.88
146	0.2567	35.4	8.2	9.25	3.78
147	0.2506	16.8	25.1	9.70	3.74
148	0.2513	-14.3	0.8	10.15	#NUM!
149	0.3500	34.9	5.7	10.68	3.70
150	0.1474	0.0	295.1	11.13	5.69
151	0.2042	24.5	-7.3	11.44	2.84
152	0.2406	17.9	-4.6	11.83	2.59
153	0.2539	12.6	-6.3	12.27	1.84
154	0.2422	15.3	-8.3	12.72	1.95
155	0.2693	23.0	-5.2	13.17	2.88
156	0.2433	0.0	-18.1	13.63	#NUM!
157	0.2496	30.4	-10.0	14.07	3.02
158	0.2905	42.3	19.3	14.55	4.12
159	0.4196	15.3	-2.4	15.18	2.55
160	0.3056	34.4	12.1	15.82	3.84
161	0.2118	19.4	-26.0	16.28	#NUM!

162	0.2485	20.1	9.7	16.69	3.39
163	0.2626	55.2	75.0	17.15	4.87
164	0.2503	30.4	22.0	17.60	3.96
165	0.2469	18.6	-9.7	18.05	2.19
166	0.2465	34.9	0.4	18.49	3.56
167	0.3199	24.4	4.7	18.99	3.37
168	0.1967	37.6	29.0	19.45	4.20
169	0.2056	16.5	-14.6	19.81	0.67
170	0.2503	36.4	-3.2	20.21	3.50
171	0.2329	19.8	-11.2	20.64	2.15
172	0.2517	17.1	-23.0	21.07	#NUM!
173	0.2817	41.9	6.0	21	

Nuclide 99-Tc
Addition 1% Fe(II) as FeO
Detector Liq. Scint.
Window 350-850
Meas. time 10 m
Background 68.7 cpm
Diff. time 36 d
Cell length 50 mm

Sample no.	Weight	cpm/g HCl	cpm/g HCl+NaBrO3	X mm	LnC
1	0.0817	-80.8	287.6	26.98	5.33
2	0.1097	6.4	5.5	26.83	2.47
3	0.1076	-20.4	-26.0	26.65	#NUM!
4	0.1535	24.8	-17.6	26.44	1.97
5	0.1021	-51.9	39.2	26.24	#NUM!
6	0.1117	-28.6	-2.7	26.06	#NUM!
7	0.1108	-28.0	2.7	25.88	#NUM!
8	0.1167	11.1	6.9	25.70	2.89
9	0.1160	34.5	23.3	25.51	4.06
10	0.1189	9.3	-30.3	25.32	#NUM!
11	0.1221	23.8	14.7	25.12	3.65
12	0.1243	4.8	-8.0	24.93	#NUM!
13	0.1170	6.8	8.5	24.73	2.73
14	0.1190	15.1	-27.7	24.54	#NUM!
15	0.1115	40.4	-24.2	24.35	2.78
16	0.1309	24.4	0.8	24.16	3.23
17	0.1141	22.8	15.8	23.96	3.65
18	0.1245	4.8	-8.8	23.77	#NUM!
19	0.1199	-22.5	-0.8	23.57	#NUM!
20	0.1234	-13.8	-13.0	23.37	#NUM!
21	0.1116	-34.1	174.7	23.18	4.95
22	0.1258	32.6	10.3	22.99	3.76
23	0.1257	19.9	-25.5	22.79	#NUM!
24	0.1265	-15.0	-8.7	22.58	#NUM!
25	0.1038	43.4	18.3	22.39	4.12
26	0.1226	-9.8	-2.4	22.21	#NUM!
27	0.1168	-35.1	28.3	22.02	#NUM!
28	0.1292	35.6	27.1	21.82	4.14
29	0.1211	33.9	13.2	21.62	3.85
30	0.1244	-21.7	8.8	21.42	#NUM!
31	0.1150	-2.6	-7.8	21.22	#NUM!
32	0.1315	16.7	-6.1	21.02	2.37
33	0.1322	15.9	9.8	20.81	3.25
34	0.1067	41.2	27.2	20.62	4.23
35	0.1131	-6.2	-23.0	20.44	#NUM!
36	0.5754	-5.9	0.7	19.88	#NUM!
37	0.3258	19.3	15.3	19.15	3.55
38	0.0921	11.9	61.9	18.82	4.30
39	0.1254	24.7	-4.8	18.64	2.99
40	0.1235	-9.7	30.8	18.44	3.05
41	0.1108	6.3	29.8	18.25	3.59
42	0.1275	7.8	-0.8	18.06	1.95
43	0.1217	28.8	-25.5	17.85	1.19
44	0.1246	26.5	25.7	17.66	3.95
45	0.1231	13.8	-24.4	17.46	#NUM!

46	0.1206	0.0	57.2	17.26	4.05
47	0.1277	22.7	17.2	17.06	3.69
48	0.1196	-11.7	15.9	16.86	1.43
49	0.1167	9.4	41.1	16.67	3.92
50	0.1186	21.1	-8.4	16.48	2.54
51	0.1164	46.4	17.2	16.29	4.15
52	0.1401	13.6	-3.6	16.08	2.30
53	0.1110	18.0	16.2	15.87	3.53
54	0.1354	28.8	0.0	15.68	3.36
55	0.1081	14.8	27.8	15.48	3.75
56	0.1328	12.0	7.5	15.28	2.97
57	0.1198	7.5	25.0	15.08	3.48
58	0.1216	14.8	21.4	14.88	3.59
59	0.1227	37.5	-7.3	14.69	3.41
60	0.1242	42.7	28.2	14.49	4.26
61	0.1205	5.0	-14.9	14.29	#NUM!
62	0.0599	-48.4	35.1	14.14	#NUM!
63	0.1844	58.6	19.0	13.94	4.35
64	0.1265	58.5	19.8	13.69	4.36
65	0.1082	44.4	43.4	13.50	4.48
66	0.1273	33.8	3.1	13.31	3.61
67	0.1330	58.6	52.6	13.10	4.71
68	0.1235	13.0	-9.7	12.89	1.18
69	0.1178	39.0	23.8	12.70	4.14
70	0.1221	42.6	13.1	12.51	4.02
71	0.1225	3.3	6.5	12.31	2.28
72	0.1248	19.2	28.0	12.11	3.86
73	0.1230	69.1	11.4	11.91	4.39
74	0.1287	69.2	10.9	11.70	4.38
75	0.1162	54.2	-36.1	11.51	2.89
76	0.1279	19.5	39.9	11.31	4.08
77	0.1246	44.9	6.4	11.10	3.94
78	0.1206	39.8	17.4	10.90	4.05
79	0.1198	5.8	-13.4	10.71	#NUM!
80	0.1243	37.0	0.8	10.51	3.63
81	0.1167	-10.3	49.7	10.32	3.67
82	0.1262	60.2	-21.4	10.12	3.66
83	0.1275	-11.0	27.5	9.92	2.80
84	0.1241	58.0	16.1	9.71	4.31
85	0.1196	76.1	12.5	9.52	4.48
86	0.1330	55.6	4.5	9.31	4.10
87	0.1254	53.4	-7.2	9.10	3.83
88	0.4829	10.8	9.9	8.61	3.03
89	0.1636	34.8	28.7	8.09	4.15
90	0.0967	38.3	40.3	7.88	4.36
91	0.1229	30.9	-9.8	7.70	3.05
92	0.1214	20.6	14.0	7.50	3.54
93	0.1276	51.7	45.5	7.30	4.58
94	0.1167	33.4	-4.3	7.10	3.37
95	0.1266	55.3	21.3	6.90	4.34
96	0.1340	45.5	55.2	6.69	4.61
97	0.1165	109.9	77.3	6.49	5.23
98	0.1279	125.1	102.4	6.29	5.43
99	0.1110	94.6	104.5	6.10	5.29
100	0.1527	172.2	219.4	5.89	5.97
101	0.1255	239.0	298.8	5.66	6.29
102	0.1023	403.7	452.6	5.48	6.75
103	0.1243	613.0	596.1	5.29	7.10

104	0.1264	812.5	772.2	5.09	7.37
105	0.1264	972.3	904.3	4.89	7.54
106	0.1259	1439.2	1277.2	4.68	7.91
107	0.1190	1684.0	1799.2	4.48	8.16
108	0.1145	2448.0	2572.9	4.30	8.52
109	0.1392	2887.9	2782.3	4.09	8.64
110	0.1277	4406.4	4007.8	3.87	9.04
111	0.1192	5421.1	4490.8	3.67	9.20
112	0.1192	6677.0	5109.9	3.48	9.37
113	0.0899	7280.3	5571.7	3.31	9.46
114	0.1317	9810.2	7768.4	3.13	9.77
115	0.1203	13257.7	10194.5	2.93	10.06
116	0.1087	13581.4	10271.4	2.74	10.08
117	0.1287	14462.3	10830.6	2.55	10.14
118	0.1253	19775.7	14077.4	2.35	10.43
119	0.1225	25214.7	17428.6	2.15	10.66
120	0.0966	24612.8	17361.3	1.97	10.64
121	0.1526	35049.1	25559.6	1.77	11.01
122	0.3275	16928.2	28174.4	1.22	10.72
123	0.3275	25477.3	42328.9	0.69	11.12
124	0.1812	20801.3	13687.1	0.44	10.45
125	0.1159	126756.7	70766.2	0.20	12.19
126	0.1261	175340.2	103272.0	0.00	12.54
127	0.1227	74868.0	47077.4	0.20	11.71
128	0.1313	60193.5	39501.9	0.41	11.51
129	0.2543	30779.0	31282.0	0.72	11.04
130	0.2533	18033.2	19107.4	1.13	10.52
131	0.2598	7015.4	7280.6	1.54	9.57
132	0.2497	4292.8	5036.8	1.96	9.14
133	0.2554	2512.5	3038.0	2.36	8.62
134	0.2299	1025.7	1525.0	2.76	7.84
135	0.2758	395.2	881.1	3.17	7.15
136	0.2749	156.8	322.3	3.61	6.17
137	0.2601	85.0	159.2	4.04	5.50
138	0.4851	11.1	34.0	4.65	3.81
139	0.0278	-312.9	-348.9	5.06	#NUM!
140	0.2124	-7.1	6.1	5.26	#NUM!
141	0.2583	16.3	-26.3	5.64	#NUM!
142	0.2428	3.3	-16.9	6.04	#NUM!
143	0.2502	9.2	-15.2	6.44	#NUM!
144	0.2525	0.4	2.8	6.85	1.15
145	0.2640	11.7	-6.8	7.27	1.59
146	0.2578	43.4	14.4	7.69	4.06
147	0.2652	-6.4	-3.4	8.11	#NUM!
148	0.2497	1.2	4.8	8.53	1.79
149	0.2532	0.4	-10.3	8.93	#NUM!
150	0.2511	-5.2	-13.9	9.34	#NUM!
151	0.2415	-2.9	-24.4	9.74	#NUM!
152	0.2639	11.7	-31.5	10.15	#NUM!
153	0.2385	17.6	-27.3	10.56	#NUM!
154	0.2635	7.6	-22.0	10.96	#NUM!
155	0.2476	-16.6	-31.5	11.38	#NUM!
156	0.2535	8.7	-3.9	11.78	1.55
157	0.2576	19.4	-11.3	12.20	2.10
158	0.2456	1.2	-20.4	12.60	#NUM!
159	0.2688	24.9	-9.7	13.02	2.72
160	0.2402	12.9	-2.1	13.43	2.38
161	0.2417	8.7	-5.8	13.82	1.06

162	0.2619	6.1	-17.6	14.23	#NUM!
163	0.2472	33.2	-23.1	14.64	2.31
164	0.2388	-11.7	-3.8	15.03	#NUM!
165	0.2477	0.0	-11.7	15.43	#NUM!
166	0.2763	26.4	-4.0	15.85	3.11
167	0.2281	5.3	-22.4	16.26	#NUM!
168	0.2348	6.4	-22.1	16.63	#NUM!
169	0.2619	14.1	5.0	17.03	2.95
170	0.2444	-8.6	-15.5	17.44	#NUM!
171	0.2027	3.0	-24.7	17.81	#NUM!
172	0.3531	-0.8	-7.1	18.26	#NUM!
173	0.1700	11.2	-7.6	18.68	1.26
174	0.2568	8.6	-12.1	19.02	#NUM!
175	0.2434	24.2	-14.0	19.43	2.33
176	0.1883	34.5	-14.3	19.78	3.00
177	0.3044	14.5	1.3	20.18	2.76
178	0.2252	15.5	-15.5	20.61	#NUM!
179	0.3227	1.9	-20.5	21.05	#NUM!
180	0.1791	1.7	16.2	21.45	2.88
181	0.8347	-1.7	-0.4	22.27	#NUM!

Nuclide	99-Tc
Addition	1% Cu(0)
Detector	Liq. Scint.
Window	350-850
Meas. time	10 m
Background	68.7 cpm
Diff. time	25 d
Cell length	50 mm

Sample no.	Weight	cpm/g HCl	cpm/g tot	X mm	LnC
1	0.0771	-107.7	-79.1	20.58	0.00
2	0.1305	18.4	479.7	20.41	6.17
3	0.1267	20.5	262.8	20.21	5.57
4	0.1222	-4.1	234.9	20.01	5.46
5	0.1142	9.6	267.1	19.82	5.59
6	0.1047	28.7	175.7	19.64	5.17
7	0.1341	35.8	254.3	19.45	5.54
8	0.1098	-39.2	119.3	19.26	4.78
9	0.1148	-13.1	171.6	19.08	5.15
10	0.1197	-3.3	96.1	18.89	4.57
11	0.1282	-47.6	56.2	18.69	4.03
12	0.1096	28.3	38.3	18.50	3.65
13	0.1283	6.2	85.7	18.31	4.45
14	0.1198	17.5	76.0	18.11	4.33
15	0.1148	43.6	53.1	17.92	3.97
16	0.2133	9.4	-4.7	17.66	0.00
17	0.1338	68.8	100.9	17.38	4.61
18	0.1210	22.3	39.7	17.18	3.68
19	0.1342	90.9	60.4	16.98	4.10
20	0.1079	40.8	25.0	16.78	3.22
21	0.1214	-20.6	-40.4	16.60	0.00
22	0.1336	53.1	85.3	16.39	4.45
23	0.1233	47.9	25.1	16.19	3.22
24	0.1157	91.6	110.6	16.00	4.71
25	0.1215	64.2	45.3	15.81	3.81
26	0.1040	51.9	16.3	15.63	2.79
27	0.1186	32.9	-4.2	15.45	0.00
28	0.1290	41.1	27.1	15.25	3.30
29	0.0884	171.9	113.1	15.08	4.73
30	0.1624	51.1	65.3	14.88	4.18
31	0.1162	134.3	181.6	14.65	5.20
32	0.1319	63.7	-2.3	14.46	0.00
33	0.1243	139.2	182.6	14.25	5.21
34	0.1079	173.3	231.7	14.06	5.45
35	0.1221	107.3	96.6	13.88	4.57
36	0.1250	110.4	89.6	13.68	4.50
37	0.1325	150.2	160.0	13.48	5.08
38	0.1271	187.3	204.6	13.27	5.32
39	0.1133	86.5	41.5	13.08	3.73
40	0.1252	174.9	135.8	12.89	4.91
41	0.1228	243.5	269.5	12.69	5.60
42	0.1404	148.9	191.6	12.48	5.26
43	0.1220	87.7	109.0	12.27	4.69
44	0.1282	224.6	259.8	12.07	5.56
45	0.1185	429.5	490.3	11.87	6.20

46	0.0990	273.7	316.2	11.70	5.76
47	0.0990	380.8	372.7	11.54	5.92
48	0.0990	70.7	0.0	11.38	0.00
49	0.0990	406.1	506.1	11.22	6.23
50	0.1250	139.2	133.6	11.04	4.89
51	0.1206	466.0	602.8	10.84	6.40
52	0.1364	481.7	610.7	10.64	6.41
53	0.1189	325.5	413.8	10.43	6.03
55	0.1283	145.8	290.7	10.24	5.67
56	0.1181	474.2	668.9	10.04	6.51
57	0.1152	733.5	1054.7	9.85	6.96
58	0.1385	428.2	598.6	9.65	6.39
59	0.1168	645.5	823.6	9.45	6.71
60	0.1303	615.5	888.0	9.25	6.79
61	0.1208	601.0	870.0	9.05	6.77
62	0.1227	553.4	866.3	8.85	6.76
63	0.1411	922.0	1375.6	8.64	7.23
64	0.1195	472.0	923.8	8.43	6.83
65	0.1245	669.9	1019.3	8.24	6.93
66	0.1151	977.4	1438.7	8.05	7.27
67	0.1332	1040.5	1452.0	7.85	7.28
68	0.1297	934.5	1409.4	7.64	7.25
69	0.1240	1035.5	1541.9	7.43	7.34
70	0.1272	1044.0	1567.6	7.23	7.36
71	0.1359	1314.2	2063.3	7.02	7.63
72	0.1073	1992.5	2751.2	6.83	7.92
73	0.1327	1488.3	2209.5	6.64	7.70
74	0.1182	1254.7	1820.6	6.43	7.51
75	0.1261	1264.9	1885.0	6.24	7.54
76	0.1217	1585.9	2498.8	6.04	7.82
77	0.1301	1649.5	2505.0	5.84	7.83
78	0.1284	2352.8	3613.7	5.63	8.19
79	0.1228	2075.7	3135.2	5.43	8.05
80	0.1291	2251.7	3416.0	5.23	8.14
81	0.1245	1673.9	2537.3	5.03	7.84
82	0.1194	1907.9	2857.6	4.83	7.96
83	0.1300	1683.8	2536.9	4.63	7.84
84	0.1302	2050.7	3149.0	4.42	8.05
85	0.1230	2441.5	3704.1	4.22	8.22
86	0.1228	3013.0	4560.3	4.02	8.43
87	0.1229	1901.5	2814.5	3.83	7.94
88	0.1332	3801.1	5429.4	3.62	8.60
89	0.1250	3294.4	5143.2	3.42	8.55
90	0.1237	4876.3	7910.3	3.22	8.98
91	0.1213	3922.5	5989.3	3.02	8.70
92	0.1261	3850.1	6323.6	2.82	8.75
93	0.1271	3740.4	5853.7	2.62	8.67
94	0.1286	3968.1	6223.2	2.42	8.74
95	0.1253	3401.4	4566.6	2.21	8.43
96	0.1238	4762.5	7191.4	2.01	8.88
97	0.1297	4792.6	7344.6	1.81	8.90
98	0.1296	6209.9	10317.1	1.60	9.24
99	0.1226	13345.0	17779.8	1.40	9.79
100	0.1205	11879.7	14451.5	1.21	9.58
101	0.1242	10744.0	13577.3	1.01	9.52
102	0.1277	11855.1	15152.7	0.81	9.63
103	0.1285	10813.2	13730.0	0.60	9.53
104	0.1280	19107.0	22759.4	0.40	10.03

105	0.1221	16792.8	20354.6	0.20	9.92
106	0.1294	20870.2	26829.2	0.00	10.20
107	0.1203	17011.6	22103.1	0.20	10.00
108	0.1277	4924.0	8356.3	0.40	9.03
109	0.1243	-67.6	4296.1	0.60	8.37
110	0.1299	-88.5	5073.9	0.81	8.53
111	0.1200	-46.7	4694.2	1.00	8.45
112	0.1217	-76.4	5539.0	1.20	8.62
113	0.1313	-75.4	5765.4	1.40	8.66
114	0.1286	-49.0	9740.3	1.61	9.18
115	0.1215	-103.7	8194.2	1.81	9.01
116	0.1267	-78.9	9457.0	2.01	9.15
117	0.1184	-81.1	8268.6	2.20	9.02
118	0.1248	17145.8	31171.5	2.40	10.35
119	0.1349	8940.0	15647.9	2.61	9.66
120	0.1151	8426.6	15588.2	2.81	9.65
121	0.2094	13052.5	25647.1	3.07	10.15
122	0.1297	14906.7	28589.1	3.34	10.26
123	0.0497	11903.4	19855.1	3.48	9.90
124	0.1207	7424.2	12881.5	3.62	9.46
125	0.1187	10631.0	17612.5	3.81	9.78
126	0.1124	11951.1	12245.6	3.99	9.41
127	0.1175	6114.0	10570.2	4.18	9.27
128	0.1353	672.6	1051.0	4.38	6.96
129	0.1172	389.1	681.7	4.58	6.52
130	0.1233	651.3	1426.6	4.77	7.26
131	0.1193	363.8	558.3	4.97	6.32
132	0.1213	284.4	638.1	5.16	6.46
133	0.1315	520.2	1028.9	5.36	6.94
134	0.1178	573.0	1308.1	5.56	7.18
135	0.1281	394.2	750.2	5.76	6.62
136	0.2509	327.6	628.5	6.06	6.44
137	0.2576	290.8	581.5	6.47	6.37
138	0.2435	294.5	581.9	6.87	6.37
139	0.2615	322.4	643.6	7.27	6.47
140	0.2500	331.2	642.8	7.68	6.47
141	0.2474	306.8	496.4	8.08	6.21
142	0.2540	369.3	676.0	8.48	6.52
143	0.2432	320.7	564.6	8.88	6.34
144	0.2656	1183.7	2200.3	9.29	7.70
145	0.2551	505.7	902.0	9.70	6.80
146	0.3271	231.1	404.5	10.17	6.00
147	0.1628	183.0	376.5	10.56	5.93
148	0.2301	268.1	435.5	10.88	6.08
149	0.2456	199.1	418.6	11.26	6.04
150	0.2489	181.6	347.1	11.65	5.85
151	0.2556	213.6	384.2	12.06	5.95
152	0.2563	183.8	321.9	12.47	5.77
153	0.2479	363.9	659.5	12.87	6.49
154	0.2431	188.8	318.8	13.26	5.76
155	0.2581	163.5	318.9	13.66	5.76
156	0.2352	219.8	241.9	14.06	5.49
157	0.2579	223.0	361.8	14.45	5.89
158	0.2497	208.7	200.6	14.86	5.30
159	0.2449	140.5	268.7	15.25	5.59
160	0.2476	160.3	266.2	15.65	5.58
161	0.2456	125.0	249.6	16.04	5.52
162	0.2589	129.8	207.4	16.45	5.33

163	0.2392	131.3	257.9	16.85	5.55
164	0.2527	123.1	208.2	17.24	5.34
165	0.2506	107.3	179.6	17.64	5.19
166	0.2756	91.4	148.0	18.06	5.00
167	0.2297	75.8	151.9	18.47	5.02
168	0.2406	92.7	137.2	18.84	4.92
169	0.2564	86.6	172.4	19.24	5.15
170	0.2348	53.2	109.9	19.63	4.70
171	0.2434	80.5	161.1	20.02	5.08
172	0.2192	53.8	112.7	20.39	4.72
173	0.2478	73.0	148.9	20.76	5.00
174	0.2562	53.9	105.0	21.16	4.65
175	0.2508	63.4	155.9	21.57	5.05
176	0.2209	47.5	111.8	21.95	4.72
177	0.2495	93.8	151.9	22.32	5.02
178	0.2446	54.0	126.3	22.72	4.84
179	0.2522	37.3	111.8	23.12	4.72
180	0.2444	30.3	63.4	23.51	4.15
181	0.2407	94.3	225.7	23.90	5.42
182	0.2434	119.1	214.7	24.29	5.37
183	0.2489	10.0	-4.0	24.68	0.00
184	0.2405	12.5	-2.1	25.07	0.00
185	0.2464	4.1	0.0	25.46	0.00
186	0.2477	25.8	58.1	25.86	4.06
187	0.2360	-13.6	-20.4	26.25	0.00
188	0.2472	25.9	41.1	26.63	3.72
189	0.2588	1.9	0.5	27.04	0.00
190	1.3214	3.3	10.5	28.30	2.35

Nuclide 233-U
Addition 1% Cu(I) as Cu2O
Detector Liq. Scint.
Window 500-950
Meas. time 10 m
Background 52.3 cpm
Diff. time 240 d
Cell length 25 mm

Sample no.	Weight	cpm/g	X mm	LnC
1	0.0911	-31.8	15.73	#NUM!
2	0.1557	28.3	15.48	3.34
3	0.1237	11.3	15.28	2.43
4	0.1179	-5.9	15.09	#NUM!
5	0.1291	0.0	14.88	#NUM!
6	0.1181	25.4	14.69	3.23
7	0.1275	-15.7	14.48	#NUM!
8	0.1179	-26.3	14.29	#NUM!
9	0.1176	-7.7	14.10	#NUM!
10	0.1278	-17.2	13.89	#NUM!
11	0.1155	-16.5	13.71	#NUM!
12	0.1356	0.7	13.49	-0.30
13	0.1175	-16.2	13.30	#NUM!
14	0.1145	-4.4	13.11	#NUM!
15	0.1245	-4.8	12.91	#NUM!
16	0.1270	39.4	12.70	3.67
17	0.1295	37.8	12.49	3.63
18	0.1243	18.5	12.29	2.92
19	0.1259	38.1	12.09	3.64
20	0.1225	53.1	11.89	3.97
21	0.1231	8.1	11.69	2.09
22	0.1243	23.3	11.49	3.15
23	0.1205	-10.8	11.29	#NUM!
24	0.1381	47.8	11.07	3.87
25	0.1166	53.2	10.88	3.97
26	0.1231	0.0	10.68	#NUM!
27	0.1281	24.2	10.47	3.19
28	0.1318	36.4	10.26	3.60
29	0.1232	29.2	10.06	3.37
30	0.1185	-21.1	9.87	#NUM!
31	0.1259	16.7	9.67	2.81
32	0.1219	-14.8	9.47	#NUM!
33	0.1240	29.0	9.27	3.37
34	0.1232	13.8	9.07	2.62
35	0.1239	42.0	8.87	3.74
36	0.1216	9.9	8.67	2.29
37	0.1320	42.4	8.46	3.75
38	0.1219	10.7	8.26	2.37
39	0.1257	-4.8	8.06	#NUM!
40	0.1185	5.9	7.86	1.78
41	0.1256	23.9	7.66	3.17
42	0.1275	26.7	7.45	3.28
43	0.1191	17.6	7.26	2.87
44	0.1286	27.2	7.05	3.30
45	0.1253	-15.2	6.85	#NUM!

Nuclide 99-Tc
Addition 1% Fe(0)
Detector Liq. Scint.
Window 350-850
Meas. time 10 m
Background 56.9 cpm
Diff. time 552 d
Cell length 25 mm

Sample no.	Weight	cpm/g HCl+NaBrO3	X mm	LnC
1	0.1664	19	11.24	2.96
2	0.1055	21	11.08	3.04
3	0.1342	31	10.87	3.42
4	0.1214	22	10.68	3.10
5	0.1174	4	10.49	1.45
6	0.1261	-33	10.30	#NUM!
7	0.1389	-6	10.08	#NUM!
8	0.1206	-21	9.89	#NUM!
9	0.1372	26	9.68	3.27
10	0.1256	29	9.48	3.36
11	0.1295	-2	9.28	#NUM!
12	0.1220	20	9.09	3.02
13	0.1329	3	8.89	1.10
14	0.1313	-36	8.68	#NUM!
15	0.1259	-7	8.48	#NUM!
16	0.1294	1	8.28	-0.26
17	0.1248	5	8.09	1.57
18	0.1253	-16	7.89	#NUM!
19	0.1296	-5	7.69	#NUM!
20	0.1248	24	7.50	3.18
21	0.1353	-8	7.29	#NUM!
22	0.1360	3	7.07	1.08
23	0.1183	4	6.89	1.44
24	0.1296	15	6.69	2.69
25	0.1396	-16	6.47	#NUM!
26	0.1252	14	6.27	2.67
27	0.1308	-8	6.07	#NUM!
28	0.1288	-5	5.87	#NUM!
29	0.1374	-1	5.66	#NUM!
30	0.1232	-7	5.46	#NUM!
31	0.1246	-17	5.27	#NUM!
32	0.1364	0	5.06	#NUM!
33	0.1352	0	4.85	#NUM!
34	0.1306	19	4.64	2.95
35	0.1255	2	4.45	0.87
36	0.1329	16	4.24	2.76
37	0.1332	-9	4.03	#NUM!
38	0.1316	-12	3.83	#NUM!
39	0.1321	-56	3.62	#NUM!
40	0.1349	-8	3.41	#NUM!
41	0.1131	-11	3.23	#NUM!
42	0.1374	-14	3.02	#NUM!
43	0.1186	30	2.84	3.38
44	0.1400	22	2.62	3.10
45	0.1127	-33	2.44	#NUM!

46	0.1486	9	2.21	2.24
47	0.1170	-11	2.03	#NUM!
48	0.1280	-15	1.83	#NUM!
49	0.1411	-11	1.61	#NUM!
50	0.1302	-2	1.41	#NUM!
51	0.7517	52858	0.23	10.88
52	0.1280	303039	0.03	12.62
53	0.1335	146798	0.17	11.90
54	0.1366	1865	0.39	7.53
55	0.1308	94	0.59	4.54
56	0.1298	34	0.79	3.52
57	0.1258	46	0.99	3.83
58	0.1329	29	1.20	3.35
59	0.1342	5	1.41	1.65
60	0.1234	-36	1.60	#NUM!
61	0.1110	-30	1.77	#NUM!
62	0.1386	-17	1.99	#NUM!
63	0.1322	-1	2.19	#NUM!
64	0.1283	-2	2.39	#NUM!
65	0.1161	8	2.57	2.05
66	0.1402	10	2.79	2.30
67	0.1358	35	3.00	3.57
68	0.1279	15	3.20	2.70
69	0.1240	-3	3.40	#NUM!
70	0.1366	-26	3.61	#NUM!
71	0.1180	23	3.79	3.13
72	0.1343	-21	4.00	#NUM!
73	0.1189	36	4.19	3.59
74	0.1379	8	4.40	2.08
75	0.1223	18	4.59	2.89
76	0.1432	54	4.82	3.98
77	0.1316	14	5.02	2.67
78	0.1202	20	5.21	2.99
79	0.1316	-4	5.41	#NUM!
80	0.1288	5	5.61	1.69
81	0.2815	10	6.05	2.26
82	0.2564	-2	6.45	#NUM!
83	0.2672	3	6.87	1.10
84	0.2658	0	7.28	#NUM!
85	0.2562	-13	7.68	#NUM!
86	0.2679	-16	8.10	#NUM!
87	0.2759	7	8.53	1.98
88	0.2741	0	8.96	-1.01
89	0.2671	-4	9.37	#NUM!
90	0.2725	10	9.80	2.26
91	0.3284	0	10.31	-1.19
92	0.2244	20	10.66	2.98
93	0.2907	-3	11.11	#NUM!
94	0.2799	0	11.55	#NUM!
95	0.3724	-1	12.13	#NUM!
96	0.5315	8	12.96	2.04
97	0.3475	2	13.50	0.55

Nuclide 99-Tc
Addition 10% magnetite
Detector Liq. Scint.
Window 350-850
Meas. time 10 m
Background 70.2 cpm
Diff. time 17 d
Cell length 25 mm

Sample no.	Weight	cpm/g	X mm	LnC
1	0.0981	1296.6	11.68	7.17
2	0.1126	398.8	11.51	5.99
3	0.1120	-44.6	11.34	#NUM!
4	0.1082	863.2	11.17	6.76
5	0.1076	412.6	11.01	6.02
6	0.1269	-15.8	10.81	#NUM!
7	0.1143	-28.0	10.64	#NUM!
8	0.1273	-7.9	10.45	#NUM!
9	0.1186	274.0	10.26	5.61
10	0.1199	52.5	10.08	3.96
11	0.1160	259.5	9.90	5.56
12	0.1220	370.5	9.72	5.91
13	0.1072	417.9	9.55	6.04
14	0.1247	69.8	9.36	4.25
15	0.1221	47.5	9.18	3.86
16	0.1375	90.2	8.97	4.50
17	0.1143	73.5	8.79	4.30
18	0.1192	320.5	8.61	5.77
19	0.1206	500.0	8.43	6.21
20	0.1208	101.8	8.24	4.62
21	0.1247	189.3	8.05	5.24
22	0.1165	121.0	7.87	4.80
23	0.1284	154.2	7.68	5.04
24	0.1170	423.9	7.50	6.05
25	0.1198	367.3	7.32	5.91
26	0.1325	1865.7	7.11	7.53
27	0.1271	138.5	6.92	4.93
28	0.1271	152.6	6.73	5.03
29	0.1106	111.2	6.56	4.71
30	0.1332	133.6	6.35	4.90
31	0.1254	189.8	6.16	5.25
32	0.1163	221.8	5.98	5.40
33	0.1274	398.7	5.79	5.99
34	0.1116	443.5	5.62	6.09
35	0.1189	217.8	5.44	5.38
36	0.1382	219.2	5.23	5.39
37	0.1273	5242.7	5.03	8.56
38	0.1172	3671.5	4.85	8.21
39	0.1208	211.1	4.67	5.35
40	0.1187	255.3	4.49	5.54
41	0.1236	351.9	4.30	5.86
42	0.1266	242.5	4.11	5.49
43	0.1165	148.5	3.93	5.00
44	0.1287	1608.4	3.73	7.38
45	0.1162	1207.4	3.55	7.10

46	0.1286	227.1	3.36	5.43
47	0.1320	177.3	3.16	5.18
48	0.1135	232.6	2.98	5.45
49	0.1212	194.7	2.80	5.27
50	0.1238	261.7	2.61	5.57
51	0.1226	1940.5	2.42	7.57
52	0.1151	5951.3	2.25	8.69
53	0.1353	2359.2	2.04	7.77
54	0.1140	224.6	1.87	5.41
55	0.1145	502.2	1.69	6.22
56	0.1248	273.2	1.50	5.61
57	0.1250	345.6	1.31	5.85
58	0.1221	899.3	1.12	6.80
59	0.1287	370.6	0.93	5.92
60	0.1123	218.2	0.76	5.39
61	0.1331	1304.3	0.55	7.17
62	0.1234	617.5	0.36	6.43
63	0.1247	3336.0	0.17	8.11
64	0.1146	14657.9	0.00	9.59
65	0.1179	8626.0	0.18	9.06
66	0.1227	352.1	0.37	5.86
67	0.1247	281.5	0.56	5.64
68	0.1283	1352.3	0.76	7.21
69	0.1265	7262.5	0.95	8.89
70	0.1230	288.6	1.14	5.67
71	0.1203	363.3	1.32	5.90
72	0.1180	7366.9	1.50	8.90
73	0.1199	565.5	1.68	6.34
74	0.1311	256.3	1.88	5.55
75	0.1216	258.2	2.07	5.55
76	0.1398	290.4	2.28	5.67
77	0.1228	223.1	2.47	5.41
78	0.1301	297.5	2.67	5.70
79	0.1046	400.6	2.83	5.99
80	0.1060	350.9	2.99	5.86
81	0.2663	600.1	3.40	6.40
82	0.2544	645.4	3.78	6.47
83	0.2458	335.6	4.16	5.82
84	0.2560	346.1	4.55	5.85
85	0.2497	2010.4	4.93	7.61
86	0.2579	262.1	5.33	5.57
87	0.2515	249.3	5.71	5.52
88	0.2483	1981.1	6.09	7.59
89	0.2527	229.9	6.47	5.44
90	0.2466	199.1	6.85	5.29
91	0.3000	214.3	7.31	5.37
92	0.1986	475.3	7.61	6.16
93	0.2380	342.4	7.98	5.84
94	0.3331	264.5	8.48	5.58
95	0.2798	90.1	8.91	4.50
96	0.2481	100.8	9.29	4.61
97	0.3413	67.7	9.81	4.21
98	0.2541	64.5	10.20	4.17
99	0.6435	84.5	11.18	4.44
100	0.3383	5.3	11.70	1.67
101	0.5456	93.1	12.53	4.53
102	0.4184	226.1	13.17	5.42

Nuclide 99-Tc
Addition 10% vivianite
Detector Liq. Scint.
Window 350-850
Meas. time 10 m
Background 70.2 cpm
Diff. time 17 d
Cell length 25 mm

Sample no.	Weight	cpm/g	X mm	LnC
1	0.1231	277.0	13.67	5.62
2	0.1212	589.1	13.46	6.38
3	0.1200	238.3	13.26	5.47
4	0.1298	318.2	13.03	5.76
5	0.1162	766.8	12.84	6.64
6	0.1422	891.0	12.59	6.79
7	0.1215	293.0	12.38	5.68
8	0.8680	53.7	10.90	3.98
9	0.1211	466.6	10.69	6.15
10	0.1475	452.2	10.44	6.11
11	0.1158	781.5	10.24	6.66
12	0.1358	632.5	10.01	6.45
13	0.1238	512.1	9.80	6.24
14	0.1090	578.0	9.61	6.36
15	0.1247	564.6	9.40	6.34
16	0.1297	523.5	9.18	6.26
17	0.1226	768.4	8.97	6.64
18	0.1084	716.8	8.78	6.57
19	0.1159	646.2	8.58	6.47
20	0.1491	686.1	8.33	6.53
21	0.1058	1173.9	8.15	7.07
22	0.1464	670.8	7.90	6.51
23	0.1208	686.3	7.69	6.53
24	0.1238	859.5	7.48	6.76
25	0.1280	810.9	7.26	6.70
26	0.1216	827.3	7.05	6.72
27	0.1118	1364.0	6.86	7.22
28	0.1314	3606.5	6.63	8.19
29	0.1356	890.1	6.40	6.79
30	0.1224	999.2	6.19	6.91
31	0.1256	1432.3	5.98	7.27
32	0.1489	1102.1	5.72	7.00
33	0.1104	1028.1	5.53	6.94
34	0.1264	1269.8	5.32	7.15
35	0.1277	1633.5	5.10	7.40
36	0.1036	1140.0	4.92	7.04
37	0.1309	1131.4	4.70	7.03
38	0.1066	1203.6	4.52	7.09
39	0.1500	1193.3	4.26	7.08
40	0.1267	1259.7	4.04	7.14
41	0.1430	1960.8	3.80	7.58
42	0.1141	1184.0	3.60	7.08
43	0.1350	1325.9	3.37	7.19
44	0.1167	1423.3	3.17	7.26
45	0.1227	1210.3	2.96	7.10

46	0.1239	1381.8	2.75	7.23
47	0.0928	1557.1	2.59	7.35
48	0.4147	1585.0	1.88	7.37
49	0.1225	3109.4	1.67	8.04
50	0.1131	2168.0	1.48	7.68
51	0.1161	1459.9	1.28	7.29
52	0.1330	985.0	1.05	6.89
53	0.1050	1041.0	0.87	6.95
54	0.3930	7099.2	0.20	8.87
55	0.1150	7242.6	0.00	8.89
56	0.1161	3068.9	0.19	8.03
57	0.1156	2074.4	0.39	7.64
58	0.1122	1313.7	0.58	7.18
59	0.1187	2031.2	0.79	7.62
60	0.1285	1299.6	1.01	7.17
61	0.1310	1866.4	1.23	7.53
62	0.1193	1331.1	1.43	7.19
63	0.1191	3229.2	1.64	8.08
64	0.1166	1414.2	1.84	7.25
65	0.1319	2348.7	2.06	7.76
66	0.1284	1369.2	2.28	7.22
67	0.1168	1940.1	2.48	7.57
68	0.1318	1217.0	2.71	7.10
69	0.1263	1368.2	2.92	7.22
70	0.1109	4808.8	3.11	8.48
71	0.1433	1993.0	3.36	7.60
72	0.1282	973.5	3.58	6.88
73	0.1066	1345.2	3.76	7.20
74	0.1424	2169.9	4.00	7.68
75	0.1061	1102.7	4.19	7.01
76	0.1308	1194.2	4.41	7.09
77	0.2403	1054.5	4.82	6.96
78	0.1286	1089.4	5.04	6.99
79	0.1208	1015.7	5.25	6.92
80	0.1326	1058.8	5.47	6.96
81	0.2768	1275.7	5.95	7.15
82	0.2396	818.9	6.36	6.71
83	0.2352	809.1	6.76	6.70
84	0.3124	1075.2	7.29	6.98
85	0.3230	665.6	7.85	6.50
86	0.2490	1034.1	8.27	6.94
87	0.2333	784.0	8.67	6.66
88	0.2222	772.3	9.05	6.65
89	0.4197	554.4	9.77	6.32
90	0.1917	605.6	10.10	6.41
91	0.5970	430.3	11.12	6.06

Nuclide 99-Tc
Addition 10% fracture fillings
Detector Liq. Scint.
Window 350-850
Meas. time 10 m
Background 70.2 cpm
Diff. time 17 d
Cell length 25 mm

Sample no.	Weight	cpm/g	X mm	LnC
1	0.2626	1910.1	11.65	7.55
2	0.1210	1058.7	11.47	6.96
3	0.1078	455.5	11.30	6.12
4	0.1221	329.2	11.12	5.80
5	0.1276	1361.3	10.92	7.22
6	0.1079	999.1	10.76	6.91
7	0.1207	899.8	10.57	6.80
8	0.1310	1264.9	10.37	7.14
9	0.1268	1767.4	10.18	7.48
10	0.1216	988.5	9.99	6.90
11	0.1245	1351.8	9.80	7.21
12	0.1092	583.3	9.64	6.37
13	0.1261	1172.9	9.45	7.07
14	0.1233	728.3	9.26	6.59
15	0.1250	826.4	9.07	6.72
16	0.1273	758.8	8.87	6.63
17	0.1178	1839.6	8.69	7.52
18	0.1258	1066.8	8.50	6.97
19	0.1278	1947.6	8.31	7.57
20	0.1282	2207.5	8.11	7.70
21	0.1309	3013.8	7.91	8.01
22	0.1156	2097.8	7.74	7.65
23	0.1261	2251.4	7.54	7.72
24	0.1306	4840.7	7.35	8.48
25	0.1071	5522.9	7.18	8.62
26	0.1197	2904.8	7.00	7.97
27	0.1377	2347.9	6.79	7.76
28	0.1222	2153.8	6.60	7.68
29	0.1275	1844.7	6.41	7.52
30	0.1208	3764.9	6.23	8.23
31	0.1202	3163.1	6.04	8.06
32	0.1286	7399.7	5.85	8.91
33	0.1139	4686.6	5.67	8.45
34	0.1355	3888.6	5.47	8.27
35	0.1274	1989.0	5.27	7.60
36	0.1286	9108.1	5.08	9.12
37	0.1201	4393.0	4.89	8.39
38	0.1271	10495.7	4.70	9.26
39	0.1279	696.6	4.50	6.55
40	0.1285	1477.0	4.31	7.30
41	0.1346	3706.5	4.10	8.22
42	0.1159	2666.1	3.93	7.89
43	0.1233	425.8	3.74	6.05
44	0.1272	3093.6	3.55	8.04
45	0.1352	4596.9	3.34	8.43

46	0.1154	7305.0	3.16	8.90
47	0.1220	5537.7	2.98	8.62
48	0.1198	7985.0	2.79	8.99
49	0.1384	8047.0	2.58	8.99
50	0.1188	7633.8	2.40	8.94
51	0.1336	5675.1	2.20	8.64
52	0.1123	5236.9	2.03	8.56
53	0.1269	595.0	1.83	6.39
54	0.1308	8148.3	1.64	9.01
55	0.1238	19147.0	1.45	9.86
56	0.1270	378.7	1.25	5.94
57	0.1248	222.8	1.06	5.41
58	0.1214	3132.6	0.88	8.05
59	0.1298	15866.7	0.68	9.67
60	0.1276	1581.5	0.49	7.37
61	0.1233	7605.8	0.30	8.94
62	0.1242	22636.1	0.11	10.03
63	0.1269	30519.3	0.08	10.33
64	0.1214	17351.7	0.27	9.76
65	0.1197	4320.8	0.45	8.37
66	0.1193	2513.8	0.63	7.83
67	0.1305	1275.9	0.83	7.15
68	0.1247	1170.8	1.02	7.07
69	0.1271	1204.6	1.22	7.09
70	0.1220	710.7	1.40	6.57
71	0.1257	2892.6	1.59	7.97
72	0.1247	13280.7	1.78	9.49
73	0.1198	585.1	1.97	6.37
74	0.1385	3865.7	2.18	8.26
75	0.1209	273.8	2.36	5.61
76	0.2488	2315.9	2.74	7.75
77	0.2535	3604.7	3.13	8.19
78	0.2425	3865.6	3.50	8.26
79	0.2529	6087.4	3.88	8.71
80	0.2579	6168.7	4.27	8.73
81	0.2485	5428.6	4.65	8.60
82	0.2602	2442.7	5.05	7.80
83	0.2403	3039.5	5.42	8.02
84	0.2522	3272.0	5.80	8.09
85	0.2492	1912.1	6.18	7.56
86	0.2541	1363.6	6.57	7.22
87	0.2435	3248.9	6.94	8.09
88	0.2482	767.1	7.32	6.64
89	0.2551	4956.1	7.71	8.51
90	0.2643	2940.6	8.11	7.99
91	0.2868	2167.0	8.55	7.68
92	0.2380	1936.1	8.91	7.57
93	0.3029	1849.8	9.37	7.52
94	0.5272	1288.3	10.17	7.16
95	0.2611	1299.1	10.57	7.17
96	0.6814	806.6	11.61	6.69
97	0.8799	274.2	12.95	5.61

Nuclide 233-U
Addition 1% Fe(0)
Detector Liq. Scint.
Window 500-950
Meas. time 10 m
Background 52.3 cpm
Diff. time 387 d
Cell length 25 mm

Sample no.	Weight	cpm/g	X mm	LnC
1	0.1248	-21.6	14.90	#NUM!
2	0.1367	-12.4	14.69	#NUM!
3	0.1288	-29.5	14.49	#NUM!
4	0.1201	-35.8	14.30	#NUM!
5	0.1222	-1.6	14.10	#NUM!
6	0.1316	-16.0	13.90	#NUM!
7	0.1200	26.7	13.71	3.28
8	0.1286	-2.3	13.51	#NUM!
9	0.1228	29.3	13.31	3.38
10	0.1291	-22.5	13.11	#NUM!
11	0.1306	5.4	12.90	1.68
12	0.1224	16.3	12.71	2.79
13	0.1383	7.2	12.49	1.98
14	0.1276	-11.0	12.29	#NUM!
15	0.1264	23.7	12.09	3.17
16	0.1300	23.1	11.89	3.14
17	0.1242	-18.5	11.69	#NUM!
18	0.1304	10.7	11.49	2.37
19	0.1308	-11.5	11.28	#NUM!
20	0.1248	1.6	11.09	0.47
21	0.1356	-12.5	10.87	#NUM!
22	0.1156	9.5	10.69	2.25
23	0.1382	-19.5	10.47	#NUM!
24	0.1144	3.5	10.29	1.25
25	0.1338	32.9	10.08	3.49
26	0.1322	-15.1	9.87	#NUM!
27	0.1239	-1.6	9.68	#NUM!
28	0.1271	-30.7	9.48	#NUM!
29	0.1341	-28.3	9.27	#NUM!
30	0.1373	-8.7	9.05	#NUM!
31	0.1251	0.0	8.85	#NUM!
32	0.1267	1.6	8.66	0.46
33	0.1279	32.1	8.45	3.47
34	0.1235	3.2	8.26	1.18
35	0.2931	23.5	7.80	3.16
36	0.1420	-8.5	7.57	#NUM!
37	0.0879	26.2	7.44	3.26
38	0.0631	-38.0	7.34	#NUM!
39	0.0640	-51.6	7.24	#NUM!
40	0.1045	-7.7	7.07	#NUM!
41	0.1245	20.1	6.88	3.00
42	0.1298	12.3	6.67	2.51
43	0.1309	17.6	6.47	2.87
44	0.1266	-8.7	6.27	#NUM!
45	0.1280	35.9	6.06	3.58

46	0.1157	-7.8	5.88	#NUM!
47	0.1412	-41.8	5.66	#NUM!
48	0.1370	-34.3	5.44	#NUM!
49	0.1212	-56.9	5.25	#NUM!
50	0.1325	9.1	5.04	2.20
51	0.1341	-20.9	4.83	#NUM!
52	0.1225	-53.1	4.64	#NUM!
53	0.1334	-7.5	4.43	#NUM!
54	0.1269	-32.3	4.23	#NUM!
55	0.1266	-34.8	4.03	#NUM!
56	0.1274	-34.5	3.83	#NUM!
57	0.1280	-6.3	3.63	#NUM!
58	0.1204	-34.1	3.44	#NUM!
59	0.1278	-14.1	3.24	#NUM!
60	0.1316	34.2	3.03	3.53
61	0.1294	-4.6	2.83	#NUM!
62	0.1277	11.7	2.63	2.46
63	0.1352	35.5	2.41	3.57
64	0.1216	34.5	2.22	3.54
65	0.1339	23.2	2.01	3.14
66	0.1324	108.0	1.80	4.68
67	0.1222	128.5	1.61	4.86
68	0.1152	256.9	1.43	5.55
69	0.1947	314.3	1.12	5.75
70	0.1599	623.5	0.87	6.44
71	0.2810	3332.7	0.43	8.11
72	0.2895	6771.0	0.00	8.82
73	0.0903	5617.9	0.18	8.63
74	0.1204	2174.4	0.37	7.68
75	0.1511	1076.1	0.61	6.98
76	0.1249	723.0	0.81	6.58
77	0.1304	398.8	1.01	5.99
78	0.1351	241.3	1.22	5.49
79	0.1271	144.8	1.42	4.98
80	0.1244	61.9	1.62	4.13
81	0.1349	47.4	1.83	3.86
82	0.1279	9.4	2.03	2.24
83	0.1324	22.7	2.24	3.12
84	0.1252	-32.7	2.44	#NUM!
85	0.1310	-30.5	2.65	#NUM!
86	0.1223	9.0	2.84	2.20
87	0.1341	-17.2	3.05	#NUM!
88	0.1341	16.4	3.26	2.80
89	0.1204	-24.1	3.45	#NUM!
90	0.1303	-26.9	3.66	#NUM!
91	0.1371	-11.7	3.87	#NUM!
92	0.1149	-33.1	4.05	#NUM!
93	0.2768	23.8	4.49	3.17
94	0.2552	-2.7	4.89	#NUM!
95	0.2740	13.9	5.32	2.63
96	0.2502	15.2	5.71	2.72
97	0.2681	30.6	6.14	3.42
98	0.3061	18.6	6.62	2.92
99	0.2544	3.1	7.02	1.15
100	0.4124	7.5	7.67	2.02
101	0.1762	-32.3	7.95	#NUM!
102	0.3088	30.4	8.43	3.42
103	0.4435	12.2	9.13	2.50

104	0.4893	7.2	9.90	1.97

Nuclide 233-U
Addition 1% Fe(II) as FeO
Detector Liq. Scint
Window 500-950
Meas. time 10 m
Background 57.5 cpm
Diff. time 381 d
Cell length 25 mm

Sample no.	Weight	cpm/g	X mm	LnC
1	0.0459	-67.5	14.59	#NUM!
2	0.1385	18.8	14.37	2.93
3	0.1114	-25.1	14.20	#NUM!
4	0.1458	-14.4	13.97	#NUM!
5	0.1144	-10.5	13.79	#NUM!
6	0.1136	6.2	13.61	1.82
7	0.1370	16.1	13.39	2.78
8	0.1219	53.3	13.20	3.98
9	0.1206	-23.2	13.01	#NUM!
10	0.1361	-4.4	12.80	#NUM!
11	0.1244	-7.2	12.60	#NUM!
12	0.1393	16.5	12.39	2.80
13	0.1190	50.4	12.20	3.92
14	0.1276	16.5	12.00	2.80
15	0.1418	50.1	11.78	3.91
16	0.1163	-3.4	11.59	#NUM!
17	0.1315	-2.3	11.39	#NUM!
18	0.1188	26.1	11.20	3.26
19	0.1325	-3.0	10.99	#NUM!
20	0.1385	7.2	10.77	1.98
21	0.1298	12.3	10.57	2.51
22	0.1311	32.8	10.37	3.49
23	0.1230	-4.1	10.17	#NUM!
24	0.1265	-23.7	9.97	#NUM!
25	0.1336	8.2	9.76	2.11
26	0.1221	9.0	9.57	2.20
27	0.1214	-15.7	9.38	#NUM!
28	0.1204	40.7	9.19	3.71
29	0.1324	9.8	8.98	2.28
30	0.1242	37.8	8.79	3.63
31	0.1300	-10.8	8.59	#NUM!
32	0.1356	-14.0	8.37	#NUM!
33	0.1186	6.7	8.19	1.91
34	0.1299	21.6	7.98	3.07
35	0.1317	-14.4	7.78	#NUM!
36	0.1426	0.0	7.55	#NUM!
37	0.1196	-9.2	7.36	#NUM!
38	0.1238	-5.7	7.17	#NUM!
39	0.1289	-8.5	6.97	#NUM!
40	0.1366	43.2	6.75	3.77
41	0.1142	23.6	6.57	3.16
42	0.1488	51.7	6.34	3.95
43	0.1196	1.7	6.15	0.51
44	0.1303	42.2	5.95	3.74
45	0.1322	20.4	5.74	3.02

46	0.1229	60.2	5.55	4.10
47	0.1238	-29.9	5.35	#NUM!
48	0.1317	-9.9	5.15	#NUM!
49	0.1294	32.5	4.94	3.48
50	0.1376	24.7	4.73	3.21
51	0.1356	6.6	4.51	1.89
52	0.1274	17.3	4.31	2.85
53	0.1325	9.1	4.11	2.20
54	0.1193	7.5	3.92	2.02
55	0.1361	71.3	3.71	4.27
56	0.1315	98.9	3.50	4.59
57	0.1249	141.7	3.30	4.95
58	0.1295	115.1	3.10	4.75
59	0.1318	218.5	2.89	5.39
60	0.1255	397.6	2.70	5.99
61	0.1266	427.3	2.50	6.06
62	0.1397	526.1	2.28	6.27
63	0.1194	721.9	2.09	6.58
64	0.1292	983.0	1.89	6.89
65	0.1233	1416.9	1.69	7.26
66	0.1257	1631.7	1.50	7.40
67	0.1348	2210.7	1.29	7.70
68	0.1369	3254.2	1.07	8.09
69	0.1334	4198.7	0.86	8.34
70	0.1167	5013.7	0.68	8.52
71	0.1518	5710.1	0.44	8.65
72	0.1785	7315.4	0.16	8.90
73	0.1044	9437.7	0.00	9.15
74	0.0692	2650.3	0.11	7.88
75	0.1350	2734.1	0.33	7.91
76	0.1306	1419.6	0.53	7.26
77	0.1276	1144.2	0.73	7.04
78	0.1225	937.1	0.92	6.84
79	0.1346	787.5	1.13	6.67
80	0.1219	419.2	1.33	6.04
81	0.1333	495.1	1.53	6.20
82	0.1334	375.6	1.74	5.93
83	0.1216	296.1	1.94	5.69
84	0.1204	212.6	2.12	5.36
85	0.1379	164.6	2.34	5.10
86	0.1208	123.3	2.53	4.81
87	0.1430	117.5	2.75	4.77
88	0.1277	108.1	2.96	4.68
89	0.1158	63.9	3.14	4.16
90	0.1301	65.3	3.34	4.18
91	0.2793	35.8	3.78	3.58
92	0.2671	31.8	4.20	3.46
93	0.2452	38.7	4.58	3.66
94	0.2549	33.0	4.98	3.50
95	0.2709	31.7	5.41	3.46
96	0.2525	7.9	5.81	2.07
97	0.2701	29.2	6.23	3.38
98	0.2574	-2.3	6.63	#NUM!
99	0.2824	6.0	7.08	1.80
100	0.2748	17.8	7.51	2.88
101	0.9003	5.9	8.92	1.77
102	0.1145	7.0	9.10	1.94
103	0.2906	24.1	9.56	3.18

104	0.1525	0.7	9.80	-0.42
105	0.3459	11.9	10.34	2.47

Nuclide 233-U
Addition 1% Cu(0)
Detector Liq. Scint
Window 500-950
Meas. time 10 m
Background 63.4 cpm
Diff. time 367 d
Cell length 25 mm

Sample no.	Weight	cpm/g	X mm	LnC
1	0.1357	-7.4	14.58	#NUM!
2	0.1273	-12.6	14.38	#NUM!
3	0.1278	1.6	14.17	0.45
4	0.1244	-37.8	13.98	#NUM!
5	0.1214	-27.2	13.79	#NUM!
6	0.1399	13.6	13.57	2.61
7	0.1209	21.5	13.38	3.07
8	0.1193	-15.9	13.19	#NUM!
9	0.1346	37.9	12.97	3.63
10	0.1303	21.5	12.77	3.07
11	0.1300	30.8	12.56	3.43
12	0.1276	14.1	12.36	2.65
13	0.1271	26.0	12.16	3.26
14	0.1332	38.3	11.95	3.65
15	0.1230	31.7	11.76	3.46
16	0.1287	-10.1	11.56	#NUM!
17	0.1235	3.2	11.36	1.18
18	0.1300	33.1	11.16	3.50
19	0.1381	29.0	10.94	3.37
20	0.0886	-15.8	10.80	#NUM!
21	0.1554	38.0	10.55	3.64
22	0.1338	54.6	10.34	4.00
23	0.1270	55.1	10.14	4.01
24	0.1114	21.5	9.97	3.07
25	0.1444	39.5	9.74	3.68
26	0.1249	36.0	9.54	3.58
27	0.1128	61.2	9.36	4.11
28	0.1391	10.8	9.15	2.38
29	0.1292	45.7	8.94	3.82
30	0.1181	76.2	8.76	4.33
31	0.1383	68.7	8.54	4.23
32	0.1194	41.0	8.35	3.71
33	0.1299	58.5	8.14	4.07
34	0.1230	94.3	7.95	4.55
35	0.1372	86.7	7.73	4.46
36	0.1476	137.5	7.50	4.92
37	0.1159	135.5	7.32	4.91
38	0.1113	190.5	7.14	5.25
39	0.1309	182.6	6.94	5.21
40	0.1285	217.1	6.73	5.38
41	0.1349	179.4	6.52	5.19
42	0.1171	216.1	6.34	5.38
43	0.1174	252.1	6.15	5.53
44	0.1333	276.8	5.94	5.62
45	0.1391	305.5	5.72	5.72

46	0.1232	301.1	5.53	5.71
47	0.1161	371.2	5.35	5.92
48	0.1450	437.2	5.12	6.08
49	0.1117	444.0	4.94	6.10
50	0.1167	489.3	4.76	6.19
51	0.1544	481.9	4.51	6.18
52	0.1205	570.1	4.32	6.35
53	0.1351	621.0	4.11	6.43
54	0.1303	739.8	3.90	6.61
55	0.1187	807.9	3.72	6.69
56	0.1356	785.4	3.50	6.67
57	0.1228	895.8	3.31	6.80
58	0.1298	1015.4	3.11	6.92
59	0.1244	1077.2	2.91	6.98
60	0.1248	1117.0	2.71	7.02
61	0.1443	1197.5	2.49	7.09
62	0.1420	1033.8	2.26	6.94
63	0.1224	1370.9	2.07	7.22
64	0.1374	1486.9	1.85	7.30
65	0.1220	1569.7	1.66	7.36
66	0.1352	1599.9	1.45	7.38
67	0.1189	1810.8	1.26	7.50
68	0.1357	1960.9	1.04	7.58
69	0.1287	2024.1	0.84	7.61
70	0.1324	2053.6	0.63	7.63
71	0.1714	1919.5	0.36	7.56
72	0.1141	2576.7	0.18	7.85
73	0.1135	3024.7	0.00	8.01
74	0.0781	2870.7	0.12	7.96
75	0.1332	954.2	0.33	6.86
76	0.1271	1019.7	0.53	6.93
77	0.1225	875.1	0.72	6.77
78	0.1129	883.1	0.90	6.78
79	0.1363	879.7	1.12	6.78
80	0.1198	843.9	1.30	6.74
81	0.1368	723.7	1.52	6.58
82	0.1167	688.1	1.70	6.53
83	0.1275	669.8	1.90	6.51
84	0.1357	568.2	2.12	6.34
85	0.1214	598.8	2.31	6.40
86	0.1324	567.2	2.52	6.34
87	0.1189	462.6	2.71	6.14
88	0.1229	481.7	2.90	6.18
89	0.1269	415.3	3.10	6.03
90	0.1254	358.1	3.30	5.88
91	0.2904	271.7	3.76	5.60
92	0.2385	218.4	4.13	5.39
93	0.2614	186.3	4.54	5.23
94	0.2566	207.7	4.95	5.34
95	0.2537	155.7	5.35	5.05
96	0.2712	115.8	5.78	4.75
97	0.2650	88.7	6.19	4.49
98	0.2497	82.9	6.59	4.42
99	0.2635	61.9	7.00	4.12
100	0.3248	34.5	7.51	3.54
101	0.4242	-60.8	8.18	#NUM!
102	0.2191	74.9	8.53	4.32
103	0.1421	16.9	8.75	2.83

104	0.3268	-13.5	9.27	#NUM!
105	0.1776	27.6	9.55	3.32
106	0.4196	-17.2	10.21	#NUM!

Nuclide 233-U
Addition 1% Cu(I) as Cu2O
Detector Liq. Scint.
Window 500-950
Meas. time 10 m
Background 52.3 cpm
Diff. time 240 d
Cell length 25 mm

Sample no.	Weight	cpm/g	X mm	LnC
1	0.0911	-31.8	15.73	#NUM!
2	0.1557	28.3	15.48	3.34
3	0.1237	11.3	15.28	2.43
4	0.1179	-5.9	15.09	#NUM!
5	0.1291	0.0	14.88	#NUM!
6	0.1181	25.4	14.69	3.23
7	0.1275	-15.7	14.48	#NUM!
8	0.1179	-26.3	14.29	#NUM!
9	0.1176	-7.7	14.10	#NUM!
10	0.1278	-17.2	13.89	#NUM!
11	0.1155	-16.5	13.71	#NUM!
12	0.1356	0.7	13.49	-0.30
13	0.1175	-16.2	13.30	#NUM!
14	0.1145	-4.4	13.11	#NUM!
15	0.1245	-4.8	12.91	#NUM!
16	0.1270	39.4	12.70	3.67
17	0.1295	37.8	12.49	3.63
18	0.1243	18.5	12.29	2.92
19	0.1259	38.1	12.09	3.64
20	0.1225	53.1	11.89	3.97
21	0.1231	8.1	11.69	2.09
22	0.1243	23.3	11.49	3.15
23	0.1205	-10.8	11.29	#NUM!
24	0.1381	47.8	11.07	3.87
25	0.1166	53.2	10.88	3.97
26	0.1231	0.0	10.68	#NUM!
27	0.1281	24.2	10.47	3.19
28	0.1318	36.4	10.26	3.60
29	0.1232	29.2	10.06	3.37
30	0.1185	-21.1	9.87	#NUM!
31	0.1259	16.7	9.67	2.81
32	0.1219	-14.8	9.47	#NUM!
33	0.1240	29.0	9.27	3.37
34	0.1232	13.8	9.07	2.62
35	0.1239	42.0	8.87	3.74
36	0.1216	9.9	8.67	2.29
37	0.1320	42.4	8.46	3.75
38	0.1219	10.7	8.26	2.37
39	0.1257	-4.8	8.06	#NUM!
40	0.1185	5.9	7.86	1.78
41	0.1256	23.9	7.66	3.17
42	0.1275	26.7	7.45	3.28
43	0.1191	17.6	7.26	2.87
44	0.1286	27.2	7.05	3.30
45	0.1253	-15.2	6.85	#NUM!

46	0.1237	19.4	6.65	2.97
47	0.1286	27.2	6.44	3.30
48	0.1245	34.5	6.24	3.54
49	0.1216	51.8	6.04	3.95
50	0.1318	-12.1	5.83	#NUM!
51	0.1210	22.3	5.63	3.11
52	0.1322	24.2	5.42	3.19
53	0.1161	-2.6	5.23	#NUM!
54	0.1234	35.7	5.03	3.57
55	0.1238	13.7	4.83	2.62
56	0.1284	32.7	4.62	3.49
57	0.1275	5.5	4.42	1.70
58	0.1229	20.3	4.22	3.01
59	0.1248	-14.4	4.01	#NUM!
60	0.1261	0.0	3.81	#NUM!
61	0.1284	18.7	3.60	2.93
62	0.1212	52.0	3.41	3.95
63	0.1185	73.4	3.21	4.30
64	0.1249	13.6	3.01	2.61
65	0.1267	22.1	2.81	3.10
66	0.1191	32.7	2.61	3.49
67	0.1318	77.4	2.40	4.35
68	0.1197	138.7	2.21	4.93
69	0.1232	125.8	2.01	4.83
70	0.1250	227.2	1.80	5.43
71	0.1300	335.4	1.59	5.82
72	0.1181	593.6	1.40	6.39
73	0.1239	894.3	1.20	6.80
74	0.1216	1358.6	1.00	7.21
75	0.1237	1884.4	0.80	7.54
76	0.1381	3316.4	0.58	8.11
77	0.1362	3175.5	0.36	8.06
78	0.0993	8168.2	0.20	9.01
79	0.1197	12264.8	0.00	9.41
80	0.1301	10579.6	0.21	9.27
81	0.1281	8476.2	0.41	9.05
82	0.1220	5975.4	0.61	8.70
83	0.1213	4061.8	0.81	8.31
84	0.1141	2523.2	0.99	7.83
85	0.1276	1646.6	1.20	7.41
86	0.1205	981.7	1.39	6.89
87	0.1448	521.4	1.63	6.26
88	0.1117	231.9	1.81	5.45
89	0.1252	181.3	2.01	5.20
90	0.1262	147.4	2.22	4.99
91	0.1255	86.1	2.42	4.45
92	0.1174	56.2	2.61	4.03
93	0.1174	32.4	2.80	3.48
94	0.1225	26.1	3.00	3.26
95	0.1317	15.2	3.21	2.72
96	0.1230	67.5	3.41	4.21
97	0.1332	48.0	3.63	3.87
98	0.1126	60.4	3.81	4.10
99	0.1282	47.6	4.02	3.86
100	0.1275	16.5	4.22	2.80
101	0.2710	28.8	4.66	3.36
102	0.2432	44.0	5.06	3.78
103	0.2457	13.0	5.46	2.57

104	0.2544	26.7	5.87	3.29
105	0.2654	7.5	6.30	2.02
106	0.2531	17.0	6.71	2.83
107	0.2602	38.8	7.13	3.66
108	0.7463	25.2	8.34	3.23
109	0.4123	13.3	9.01	2.59
110	0.0707	-131.5	9.12	#NUM!

List of SKB reports

Annual Reports

1977–78
TR 121
KBS Technical Reports 1 – 120.
Summaries. Stockholm, May 1979.

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TR 79–28
The KBS Annual Report 1979.
KBS Technical Reports 79-01 – 79-27.
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Summaries. Stockholm, July 1983.

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TR 83–77
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Summaries. Stockholm, June 1984.

1984
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Annual Research and Development Report 1984
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Stockholm, May 1987

1987
TR 87-33
SKB Annual Report 1987
Including Summaries of Technical Reports Issued during 1987
Stockholm, May 1988

1988
TR 88-32
SKB Annual Report 1988
Including Summaries of Technical Reports Issued during 1988
Stockholm, May 1989

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TR 90-01
FARF31 –
A far field radionuclide migration code for use with the PROPER package
Sven Norman[1], Nils Kjellbert[2]
[1] Starprog AB
[2] SKB AB
January 1990

TR 90-02
Source terms, isolation and radiological consequences of carbon-14 waste in the Swedish SFR repository
Rolf Hesböl, Ignasi Puigdomenech, Sverker Evans
Studsvik Nuclear
January 1990

TR 90-03
Uncertainties in repository performance from spatial variability of hydraulic conductivities –
Statistical estimation and stochastic simulation using PROPER
Lars Lovius[1], Sven Norman[1], Nils Kjellbert[2]
[1] Starprog AB
[2] SKB AB
February 1990

TR 90-04
Examination of the surface deposit on an irradiated PWR fuel specimen subjected to corrosion in deionized water
R.S. Forsyth, U-B. Eklund, O. Mattsson, D. Schrire
Studsvik Nuclear
March 1990

TR 90-05

Potential effects of bacteria on radionuclide transport from a Swedish high level nuclear waste repository

Karsten Pedersen
University of Gothenburg, Department of General and Marine Microbiology, Gothenburg

January 1990