



SAMOFAR Final meeting

4 July 2019



SAMOFAR



SAMOFAR



Depuis 80 ans, nos connaissances
hélisent de nouveaux mondes



WP5 Overview

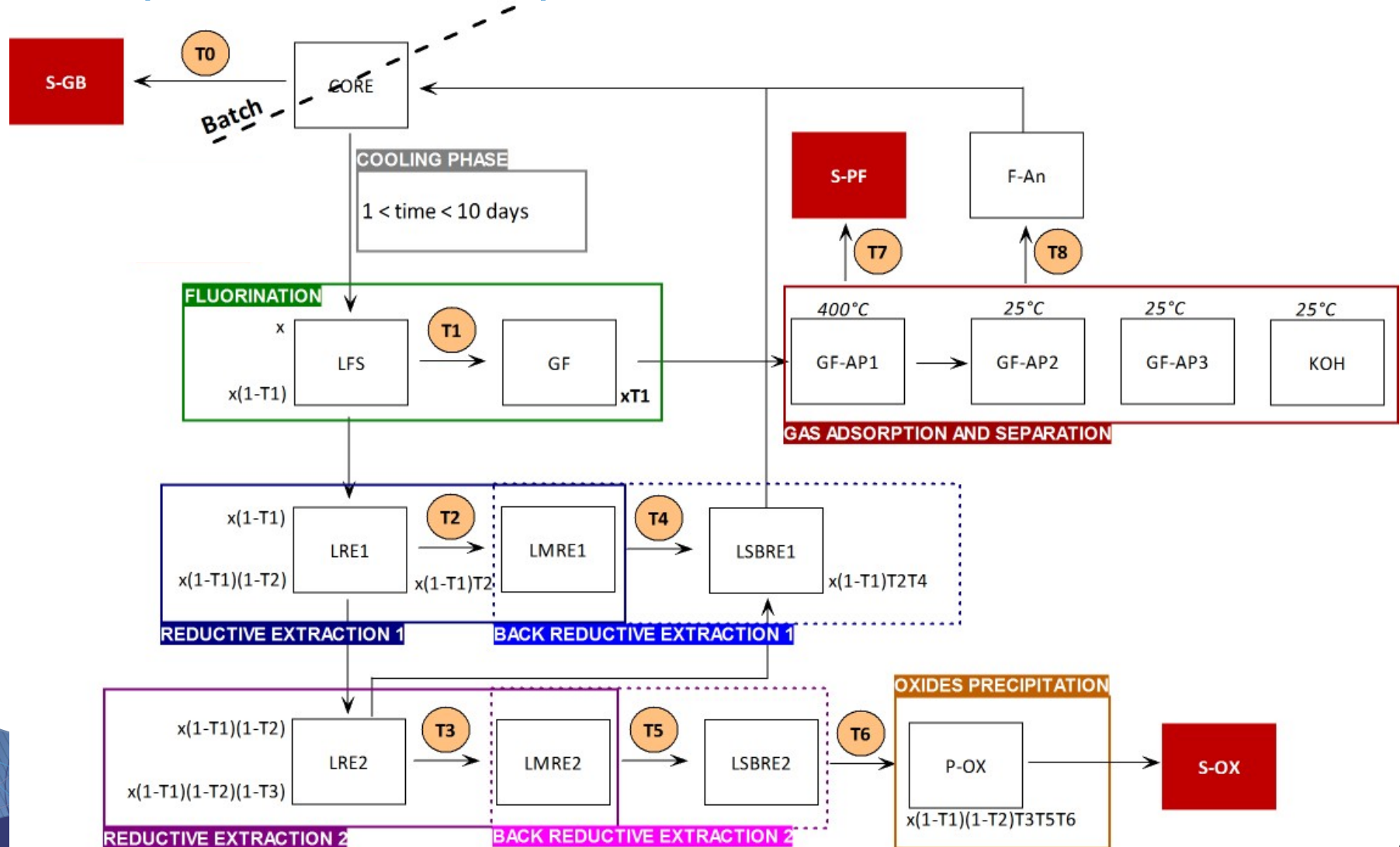
Safety evaluation of the chemical plant

- ▶ Task 5.1 Evaluation of nuclide inventory at various stages in the chemical plant (CNRS, JRC) → Deliverables 5.1 and 5.5
- ▶ Task 5.2 Coupling of neutronic and reprocessing efficiencies (CNRS)
- ▶ Task 5.3 Evaluation of re-criticality issues (CNRS, CEA) → Deliverable 5.3
- ▶ Task 5.4 Design and safety of the chemical plant (CNRS, CEA, JRC) Deliverable 5.2
- ▶ Task 5.5 Material issues (CNRS, CINVESTAV) → Deliverable 5.4

WP5 Overview

Safety evaluation of the chemical plant

Description of the chemical plant



WP5 Overview

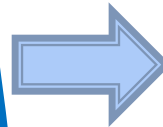
Safety evaluation of the chemical plant

Methodology

Inventory calculation
LPSC

+

Experimental, thermodynamic and
bibliographic determination of
transfer coefficients :
ITU – IPNO

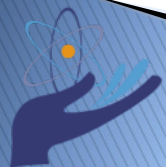
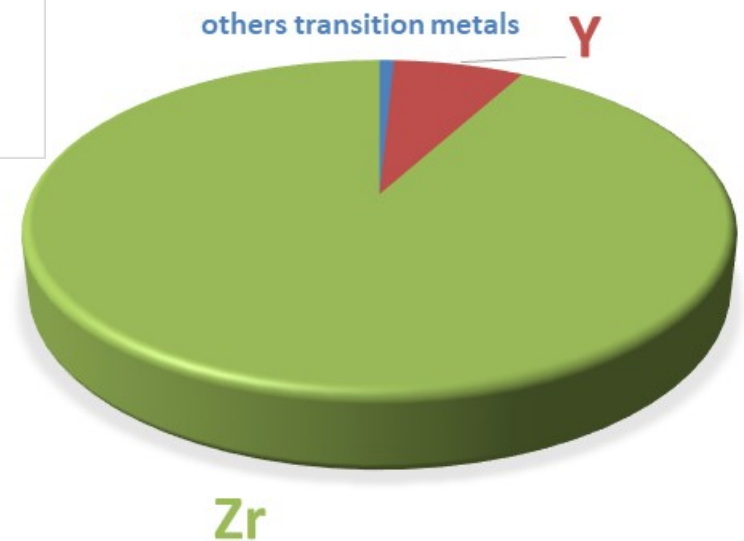
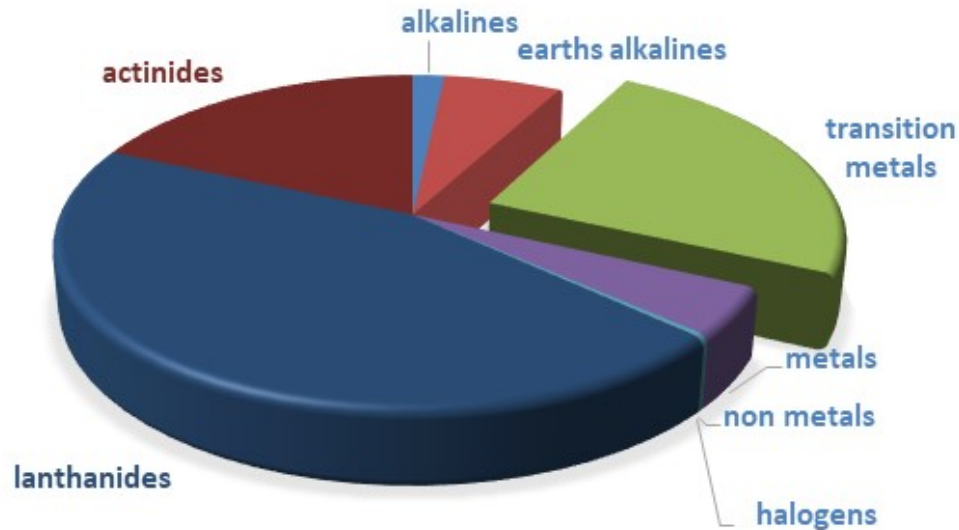


Radionuclides distribution
in the chemical plant.
Heat residual and
criticality calculations
Shieldings requirement
CEA

WP5 Overview

Safety evaluation of the chemical plant

Nuclide inventory in the batch



WP5 Overview

Safety evaluation of the chemical plant

Transfer coefficients assessment

Elément	Z	GB	FLUO	RE1	RE2	BRE1	BRE2
Li	3						
Be	4	0	0	0,15	0,3	1	1
B	5	0,98	1	0	0	0	0
C	6	0,5	0,99	0,99	0,99	1	1
N	7	1	0	0	0	0	0
O	8	0	1	0	0	0	0
F	9	0	0	0	0	0	0
Ne	10	1	0	0	0	0	0
Na	11	0	0	0,030	0,608	1	1
Mg	12	0	0	0,99	0,999	1	1
Al	13	0	0	0,99	0,999	1	1
Si	14	0,9	0,99	1	1	1	1
P	15	1	1	0	0	0	0
S	16	0,9	0,99	0	0	0	0
Cl	17	0	0,99	0	0	0	0
Ar	18	1	0	0	0	0	0
K	19	0	0	0,020	0,506	1	1
Ca	20	0	0	0,9	0,99	1	1
Sc	21	0	0	0,2	0,7	1	1
Ti	22	0	0,99	1,000	1	1	1
V	23	0	0,99	0,99	0,999	1	1
Cr	24	0	0,99	0,99	0,999	1	1
Mn	25	0	0,99	0,99	0,999	1	1
Fe	26	0	0	0,99	0,999	0,5	0,5
Co	27	0,5	0,5	0,99	0,999	0,5	0,5
Ni	28	0,5	0	0,99	0,999	0,5	0,5
Cu	29	0,5	0	0,99	0,999	0,5	0,5
Zn	30	0,5	0	0,99	0,999	0,5	0,5
Ga	31	0,5	0,99	0,99	0,999	0,1	0,1
Ge	32	0,5	0,99	0,99	0,999	0,1	0,1
As	33	0,9	0,99	0	0	0	0
Se	34	0,8	0,99	0	0	0	0
Br	35	0	0,99	0	0	0	0
Kr	36	1	0	0	0	0	0
Rb	37	0	0	0,022	0,527	1	1
Sr	38	0	0	0,8	0,99	1	1
Y	39	0	0	0,8	0,9	1	1
Zr	40	0,2	0,2	1,000	1,000	1	1
Nb	41	0,5	0,99	1	1	0,1	0,1
Mo	42	0,5	0,99	1	1	0,1	0,1
Tc	43	0,5	0,99	0,9	0,99	0	0
Ru	44	0,5	0	1	1	0	0
Rh	45	0,5	0,99	1	1	0	0
Pd	46	0,5	0	1	1	0	0
Ag	47	0,5	0	1	1	0	0
Cd	48	0,8	0,99	1	1	0	0
In	49	0,5	0	1	1	0,1	0,1

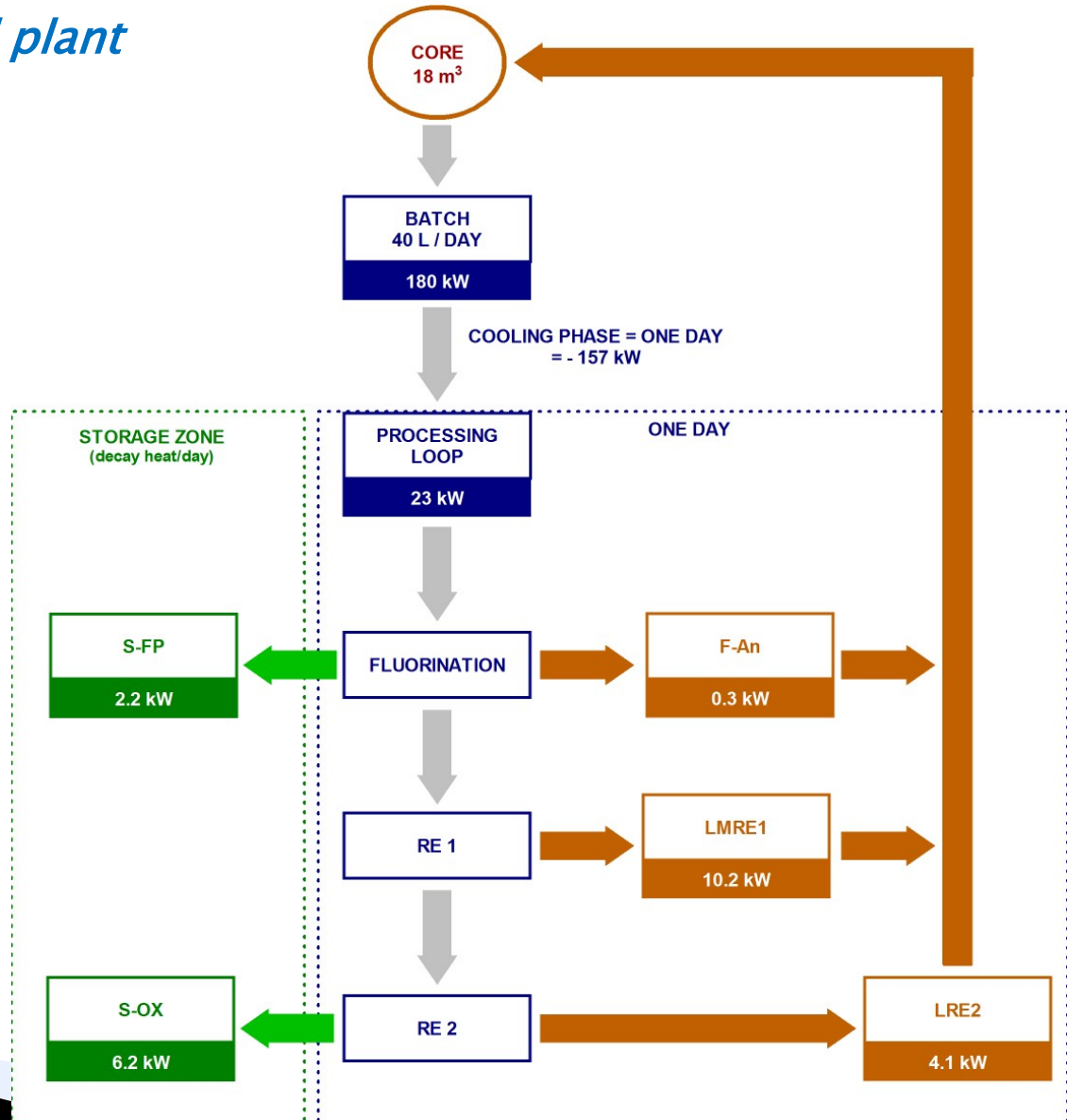
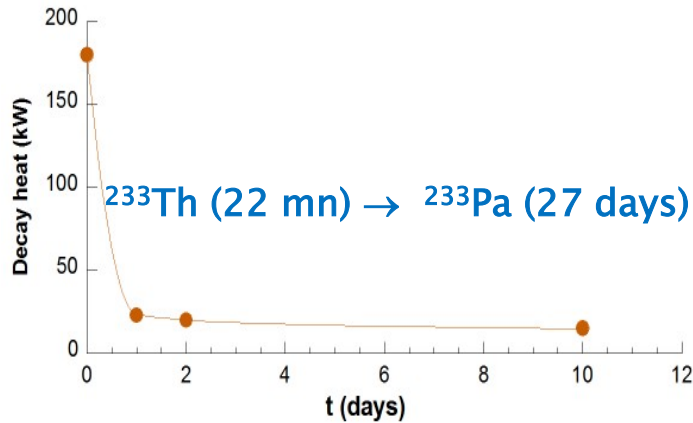
Sn	50	0,5	0,5	1	1	0,1	0,1
Sb	51	0,5	0,99	1	1	0	0
Te	52	0,5	0,99	1	1	0	0
I	53	0	0,99	0	0	0	0
Xe	54	0,99	0,9	0	0	0	0
Cs	55	0	0	0,037	0,660	1	1
Ba	56	0	0	1,000	0,997	1	1
La	57	0	0	0,068	1,000	1	1
Ce	58	0	0	0,150	0,650	1	1
Pr	59	0	0	0,150	0,650	1	1
Nd	60	0	0	0,098	1,000	1	1
Pm	61	0	0	0,061	1,000	1	1
Sm	62	0	0	0,092	1,000	1	1
Eu	63	0	0	0,035	0,989	1	1
Gd	64	0	0	0,150	0,650	1	1
Tb	65	0	0	0,150	0,650	1	1
Dy	66	0	0	0,150	0,650	1	1
Ho	67	0	0	0,150	0,650	1	1
Er	68	0	0	0,150	0,650	1	1
Tm	69	0	0	0,200	0,700	1	1
Yb	70	0	0	0,200	0,700	1	1
Lu	71	0	0	0,150	0,650	1	1
Hf	72	0	0	0,900	0,990	1	1
Ta	73	0,5	0,99	1	1	0	0
W	74	0,5	0,99	1	1	0	0
Re	75	0,5	0,99	1	1	0	0
Os	76	0,5	0	1	1	0	0
Ir	77	0,5	0,99	1	1	0	0
Pt	78	0,5	0,99	1	1	0	0
Au	79	0,5	0	1	1	0	0
Hg	80	0,5	0,99	1	1	0	0
Tl	81	0,5	0	1	1	0	0
Pb	82	0,5	0,99	1	1	0	0
Bi	83	0,5	0	1	1	0	0
Po	84	0,5	0	1	1	0	0
At	85	0,99	0,99	0	0	0	0
Rn	86	1	0	0	0	0	0
Fr	87	0	0,99	0	0	0	0
Ra	88	0	0	0,5	0,9	1	1
Ac	89	0	0	0,15	0,65	1	1
Th	90	0	0	0,051	1,000	1	1
Pa	91	0	0	0,992	1	1	1
U	92	0	0,99	0,999	1	1	1
Np	93	0	0,99	0,998	1,000	1	1
Pu	94	0	0,9	0,994	1,000	1	1
Am	95	0	0	0,992	1,000	1	1
Cm	96	0	0	0,955	1,000	1	1
Bk	97	0	0	0,900	0,999	1	1
Cf	98	0	0	0,934	1,000	1	1



WP5 Overview

Safety evaluation of the chemical plant

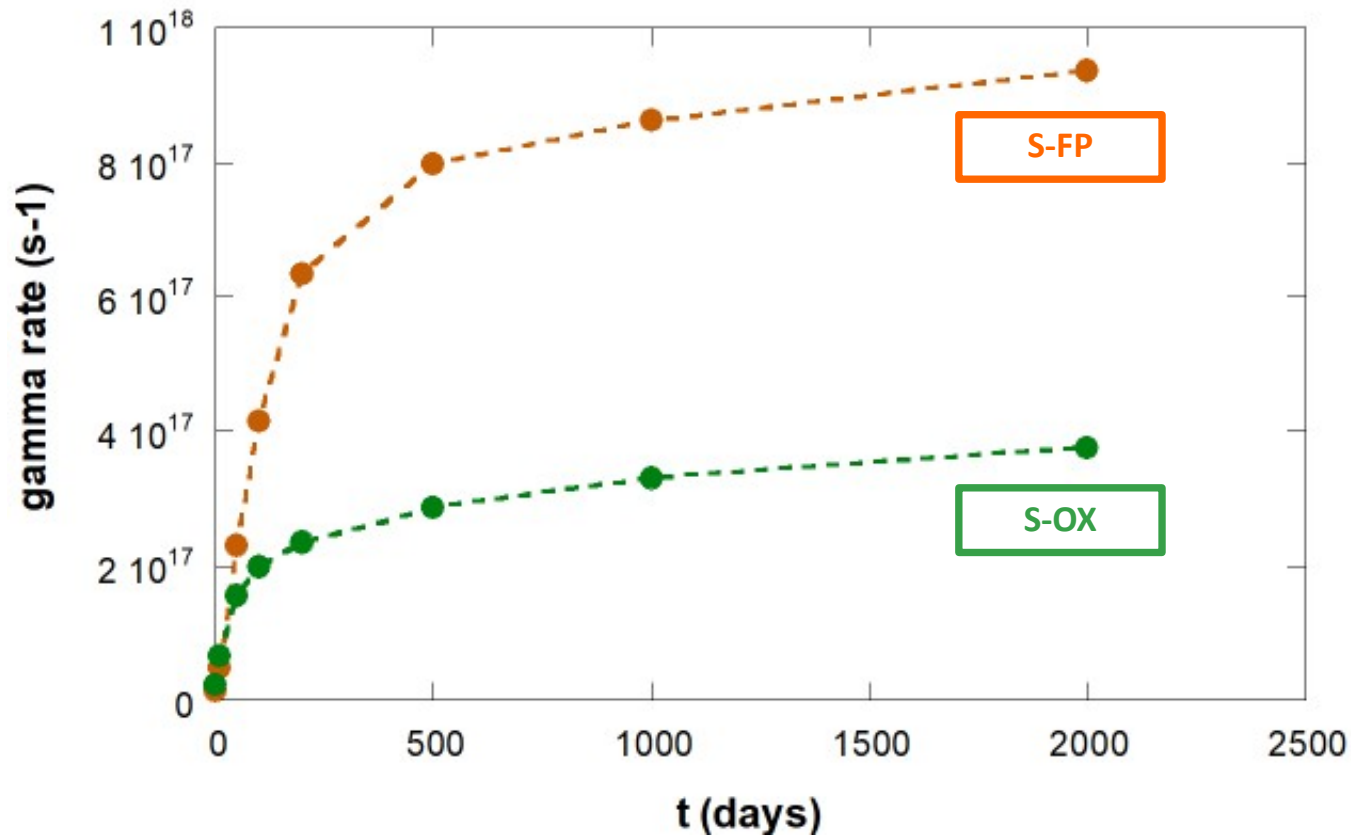
Decay heat in the chemical plant



WP5 Overview

Safety evaluation of the chemical plant

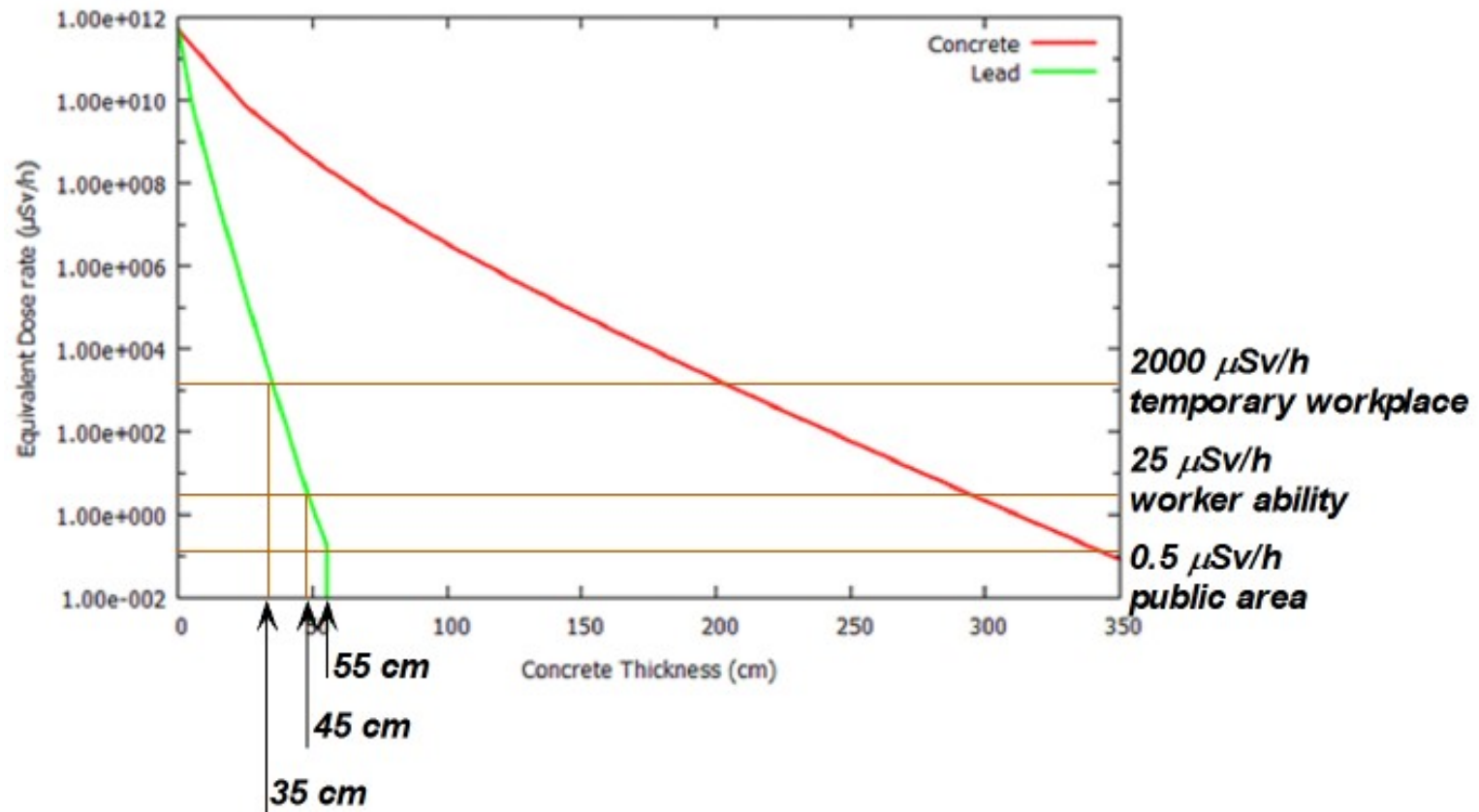
Gamma rate in the storage zones



WP5 Overview

Safety evaluation of the chemical plant

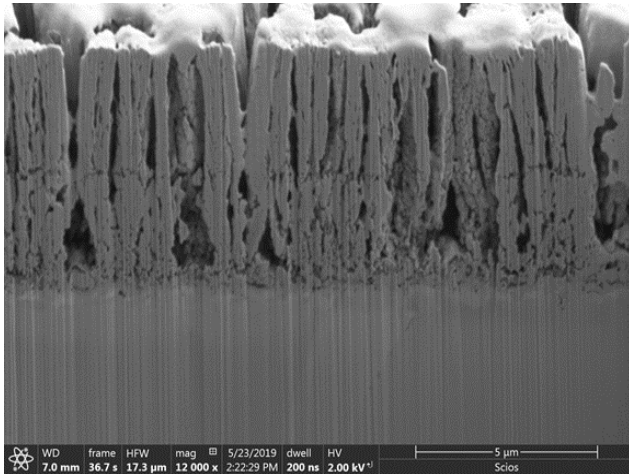
Shielding requirements



WP5 Overview

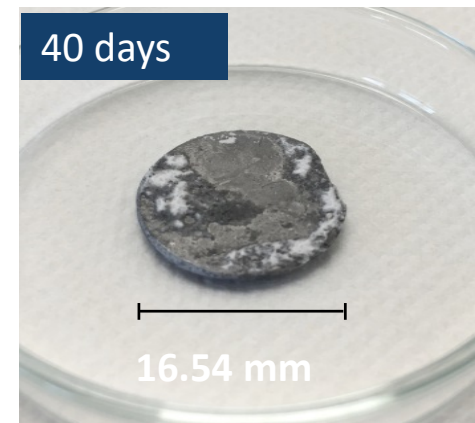
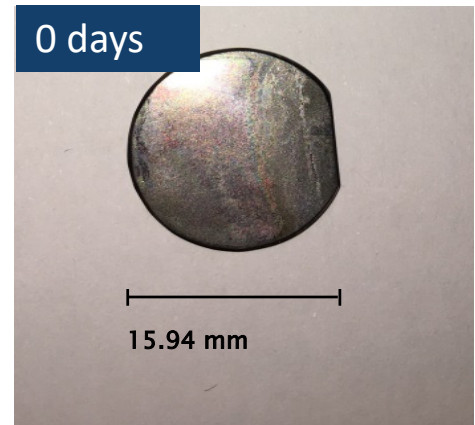
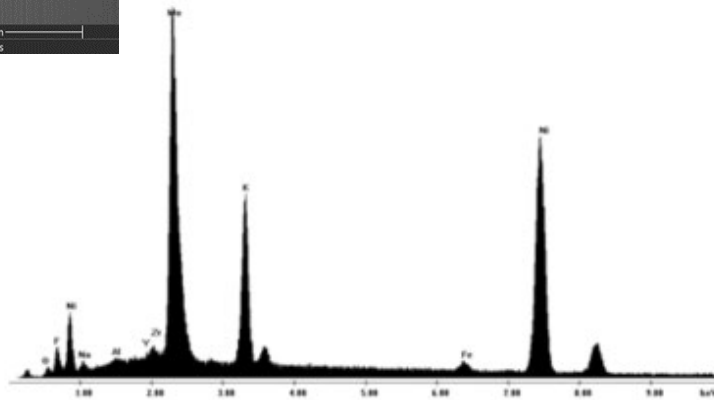
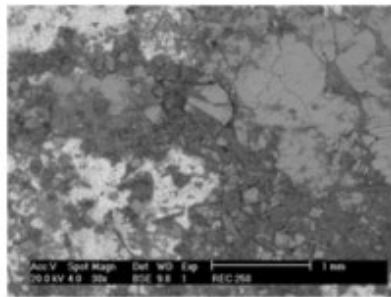
Safety evaluation of the chemical plant

Material issues



Hastelloy B covered with
 $\text{ZrO}_2\text{-17 mol\% Y}_2\text{O}_3$

In FLiNaK



In LiF-ThF₄

Thank you for your attention