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Message ID: 173 Entry time: 3/27/2023 10:35:06 AM

Experiment Date:	2023 03 27
Duration (Days):	5
User:	Stjepko Fazinic, Iva Bozicevic Mihalic, Anja Miokovic
Accelerator:	VDG & TDT
Beam Line:	Old uProbe
Project:	Hi-REXS (HRZZ projekt)
Experiment Title:	HR PIXE Na compounds
Beam:	2 MeV H, 3 MeV 4He, 2.5 MeV H, 3 MeV H
Method:	HR PIXE

Beam deflection was connected to the horizontal deflector with -700 V.

GreatControl: X Binning = OFF, Y Binning = OFF, Readout Speed = 500 kHz, Gain = Max Sensitivity, Correct Bias = UNCHECKED, $T_{\text{ccd}} = -70$ °C, $T_{\text{back}} = 23$ °C, Chiller at 18 °C

Protection mask put on SDD, we are not going to use it.

Chamber positioned according to the black marks on the floor that were drawn in February.

27.3.2023.

Beam: 2 MeV H⁺ TDT

Focus: Me 17.2 A, Ox 34.7 A

Diffraction crystal: Beryl(1010) at 10.5 cm, peeking out of holder 3 mm, with blue dot facing the main door

Current on metal before measurement ~2 nA

Samples: NaCl (position 1), NaCl+Zn (position 2), Na₂SO₄ (position 3), NaF (position 4)

WARNING! NaF = "Toxic if swallowed. Wash skin thoroughly after handling."

FILE	SAMPLE	t _{exp} /s	N _{frames}	COMMENT
2303210	NaCl	20	1	we see line in Vista on ch~600
2303211	NaCl	40	1	checking if the whole frame is available, line is visible at ch~120 -> we are satisfied
2303212	NaCl	40	1	NaKa12 line on ch~550, that is how we will collect spectrum
2303213	DARK	4	10	
2303214	NaCl	4	300	I~2-1.2 nA, big oscillations in current (increased afterwards)
2303215	NaCl	4	300	I~2.6-2 nA
2303216	NaF	40	1	NaKa12 line on ch~550 and gamma rays!
2303217	NaF	4	1	still a lot of gamma rays
2303218	DARK			
2303219	NaF	2	450	I~2.2-1.6 nA, then increased with switching magnet to I~3-3.2 nA
2303220	NaF	2	450	I~3 nA, fell at the end
2303221	NaF	2	900	I~3.4-3.2 nA
2303222	NaF	2	450	I~2.6 nA then increased to I~3.6 nA
2303223	NaF	2	450	I~3.6 nA
2303224	NaF	2	450	I~3.4 nA

28.3.2023.

Beam: 2 MeV H⁺ TDT

Focus: Me 17.0 A, Ox 34.6 A

Diffraction crystal: Beryl(1010) at , peeking out of holder 3 mm, with blue dot facing the main door

Current on metal before measurement ~ 2 nA

Samples same as yesterday: NaCl (position 1), NaCl+Zn (position 2), Na₂SO₄ (position 3), NaF (position 4)

FILE	SAMPLE	t _{exp} /s	N _{frames}	COMMENT
2303225	Na ₂ SO ₄	40	1	NaKa line visible on ch~550
2303226	Na ₂ SO ₄	10	1	I \sim 1.5 nA, line barely visible in Vista
2303227	DARK	10	10	
2303228	Na ₂ SO ₄	10	150	I \sim 2-1 nA; current is drastically decreasing over time, switching magnet is used to increase it
2303229	Na ₂ SO ₄	10	35?	I \sim 2.2 nA but soon we lost the beam so we had to stop
2303230	Na ₂ SO ₄	10	43?	I \sim 2 nA, again same problem as in 2303229
2303231	Na ₂ SO ₄	10	450	I \sim 2.2 nA, now the current is stable -> Željko says that he rarely adjusts value of Einzel lens to keep current stable
2303232	Na ₂ SO ₄	10	150	- -
2303233	Na ₂ SO ₄	10	300	- -
2303234	Na ₂ SO ₄	10	100	- -
2303235	NaCl+Zn	40	1	I \sim 1.8-2 nA, position where beam spot shines with low intensity; we see too many events in Vista
2303236	NaCl+Zn	10	1	same position, we will collect spectrum here to check the intensities of the lines
2303237	NaCl+Zn	10	20	I \sim 2.6 nA
2303238	NaCl+Zn	10	20	- -; from Matlab analysis we see ZnLa, NaKa12 and NaK34 lines, but we want higher ZnLa
2303239	NaCl+Zn	10	20	I \sim 2.6 nA, position on sample changed -> beam spot now almost does not shine -> we are satisfied with spectrum gotten after Matlab analysis, we will stay at this position
2303240	DARK	6	10	
2303241	NaCl+Zn	6	225	I \sim 3.2 nA, current is decreasing over time, we increase it with switching magnet
2303242	NaCl+Zn	6	225	I \sim 4 nA
2303243	NaCl+Zn	6	450	I \sim 3.8-4 nA
2303244	NaCl+Zn	6	225	I \sim 2.9 nA

29.3.2023.

Before measurement pure Na was specially prepared and put in chamber so that it does not oxidize.

- Na for ion source, stored in oil, was put together with sample holder and needed equipment inside bag filled with Ar. Part of Na chunk was sliced and mounted to sample holder.

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Diffraction crystal: Beryl(1010) at , peeking out of holder 3 mm, with blue dot facing the main door

Samples: NaCl (position 1), Na (position 2), Na₂SO₄ (position 3), NaF (position 4)

1st part of the day - Beam: 2 MeV H⁺ TDT

Focus: Me 17.1 A, Ox 34.7 A

Current on metal before measurement ~ 2 nA

FILE	SAMPLE	t _{exp} /s	N _{frames}	COMMENT
2303245	Na	20	1	we see really intense line in Vista on ch~600
2303246	Na	5	1	line in Vista on ch~510 as we want it
2303247	Na	2	1	- -
2303248	DARK	1	10	
2303249	Na	1	900	I \sim 2.2 nA, current is not stable, it falls to ~ 1 nA from time to time and then it is increased with switching magnet
2303250	Na	1	300	- -
2303251	Na	1	600	- -
2303252	Na	1	600	- -

2nd part of the day - Beam: 3 MeV ⁴He²⁺ TDT

Focus: Me 19.7 A, Ox 42.2 A

Current on metal before measurement ~ 3 nA

FILE	SAMPLE	t _{exp} /s	N _{frames}	COMMENT
2303253	Na	20	1	I~3 nA
2303254	Na	4	1	
2303255	DARK	4	10	
2303256	Na	4	250?	I~2.8-2.4 nA, we suddenly lost the beam so we stopped the measurement
2303257	Na	4	600	I~1.6-2.6 nA, it oscillates a lot, at frame ~540 source shut down and there was no beam for about 10 min before we got it again
2303258	Na	4	300	I~2.2-2.4 nA, after reactivation of the source current is much more stable

30.3.2023.

Beam: 3 MeV ⁴He²⁺ TDT

Focus: Me 19.7 A, Ox 42.3 A

Diffraction crystal: Beryl(1010) at , peeking out of holder 3 mm, with blue dot facing the main door

Current on metal before measurement ~2.5 nA

Samples same as yesterday: NaCl (position 1), Na (position 2), Na₂SO₄ (position 3), NaF (position 4)

FILE	SAMPLE	t _{exp} /s	N _{frames}	COMMENT
2303259	NaCl	20	1	I~2.2 nA, line visible in Vista on ch~470
2303260	NaCl	10	1	
2303261	DARK	10	10	
2303262	NaCl	10	300	I~2.2-1.5 nA, it is very unstable
2303263	NaCl	10	245?	I~1.5-2 nA, around frame 245 current was increased to 4 nA -> too many events in frame in Vista, we are going to reduce exposition time
2303264	NaCl	6	1	this exposition time is good now
2303265	DARK	6	10	
2303266	NaCl	6	300	I~3.8-4 nA, now the current is stable
2303267	NaCl	6	200	- -
2303268	NaF	20	1	I~4 nA, NaKa line visible in Vista on ch~500
2303269	NaF	6	1	
2303270	NaF	6	450	I~4-2.6 nA, last ~10 min current increased to 4.6-4.8 nA (in Vista frame seems good)
2303271	NaF	6	600	first ~10 min: I~4.6 nA, then we closed Andro's slits -> I~4 nA
2303272	Na ₂ SO ₄	40	1	I~4 nA, NaKa line visible in Vista on ch~465
2303273	Na ₂ SO ₄	10	300	I~3.8 nA
2303274	Na ₂ SO ₄	10	300	I~4 nA
2303275	Na ₂ SO ₄	10	300	- -

31.3.2023.

Diffraction crystal: Beryl(1010) at , peeking out of holder 3 mm, with blue dot facing the main door

Samples same as yesterday: NaCl (position 1), Na (position 2), Na₂SO₄ (position 3), NaF (position 4)

1st measurement - Beam: 2.5 MeV H⁺ VDG

Focus: Me 18.7 A, Ox 39.1 A

Current on metal before measurement ~2 nA

FILE	SAMPLE	t _{exp} /s	N _{frames}	COMMENT
2303276	Na	10	1	I~2 nA, NaKa line visible in Vista on ch~510
2303277	DARK	1	10	
2303278	Na	1	110?	current increased -> in Vista we see too many events, we stopped and closed Andro's slits a bit
2303279	Na	1	900	I~1-3 nA, current is oscillating a lot
2303280	Na	1	600	after some time current fell to cca 1.2 nA, increased from basement
2303281	Na	1	178?	I~2-1.25 nA, stopped to open Andro's slits
2303282	Na	1	400	I~2.3-1 nA

2nd measurement - Beam: 3 MeV H⁺ VDG

Focus: Me 20.6 A, Ox 42.9 A

Current on metal before measurement ~2.2 nA

FILE	SAMPLE	t _{exp} /s	N _{frames}	COMMENT
2303283	Na	1	600	I~1-2.2 nA, current unstable; over time it increased even over 4 nA, so we closed Andro's slits a bit
2303284	Na	1	600	I~1.8-3.8 nA
2303285	Na	1	346?	I~2.2-2.75 nA, checking current on the integrator instead of picoscope and it seems more stable; stopped because there was no beam and from Matlab analysis we concluded that we collected enough frames

3rd measurement - Beam: 2 MeV H⁺ TDT

Focus: Me 16.3 A, Ox 34.4 A

Current on metal before measurement ~2 nA

FILE	SAMPLE	t _{exp} /s	N _{frames}	COMMENT
2303286	Na(O)?	1	300	darker grey part of Na chunk -> we want to check if whole sample is pure Na or only part of it that has metallic shine; I~1.5-2 nA, by the end current fell to 1 nA
2303287	Na(O)?	1	300	darker grey part of Na chunk, I~2 nA
303288	Na(O)?	1	300	- -, from Matlab analysis we believe this is mixture of Na and NaO; we lost the beam and could not get it again so we decided to finish with the mesurement

Attachment 1:

[Uzorak_Na_-_mjerena_podrucja.png](#) 1.648 MB Uploaded 4/3/2023 2:19:07 PM | [Hide](#) | [Hide all](#)

