

Nuclear Physics Institute in Rez, Czech Republic:
**New Site for Performing
 SHE-homologue Experiments**

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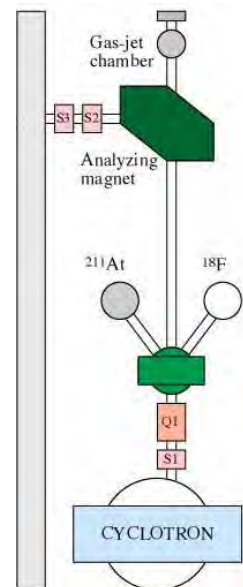
In collaboration with Prof. Jan John et al. (CTU, Prague)
 and Ing. Jan Sturza et al. (NPI, Rez)



Background

The past:

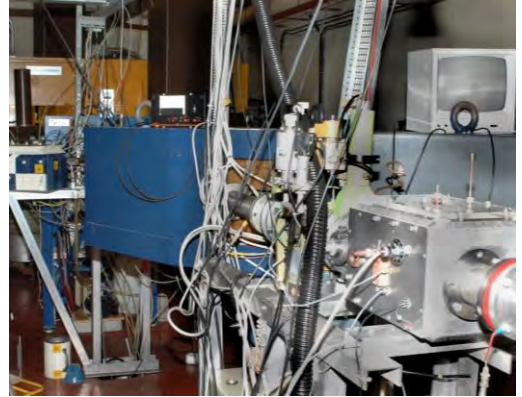
- ^3He -beam available at the Oslo Cyclotron Laboratory (operating a small Scanditronix cyclotron)
- Was useful for tests and homologue development experiments
- A complete target and gas-jet transport system built up in Oslo



Background (II)

Discontinuation:

- Steep price increase on ^3He and poor ^3He -recycling system prohibited use of ^3He beams
 - *Impossible to make the most useful homologue radionuclides*
- Ratio between benefit and cost could no longer be justified
- Operation was discontinued in 2015



New Opportunities in Rez, Czech Republic

- At the **Nuclear Physics Institute (NPI) in Rez**, just outside Prague, several cyclotrons are operated
- The **U120 cyclotron** can accelerate light ions (H^+ , H^- , D^+ , D^- , $^3\text{He}^{2+}$ and $^4\text{He}^{2+}$) and **have spare capacity**



Nuclear Physics Institute of the CAS
public research institution

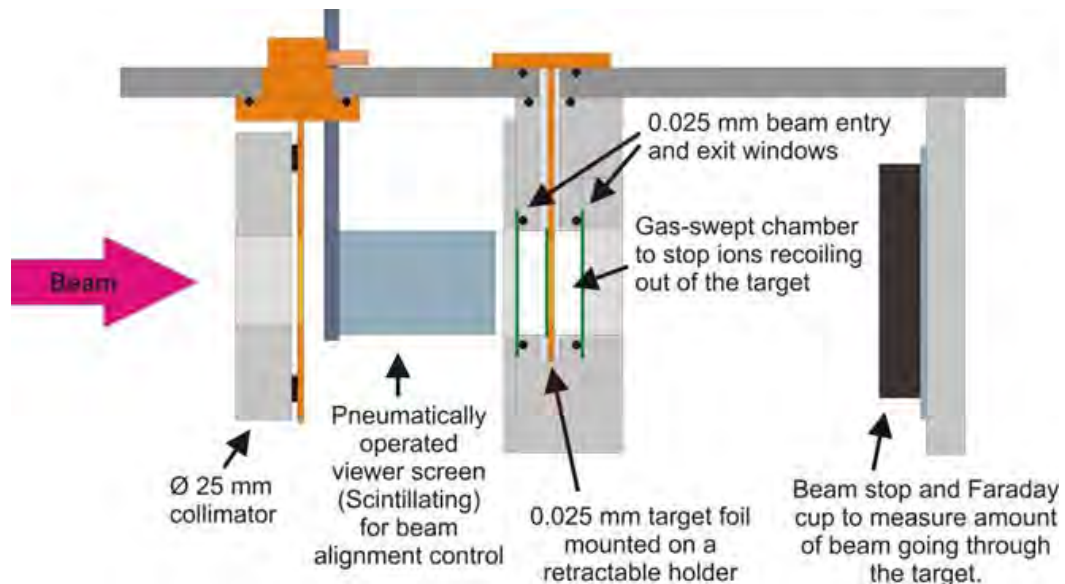


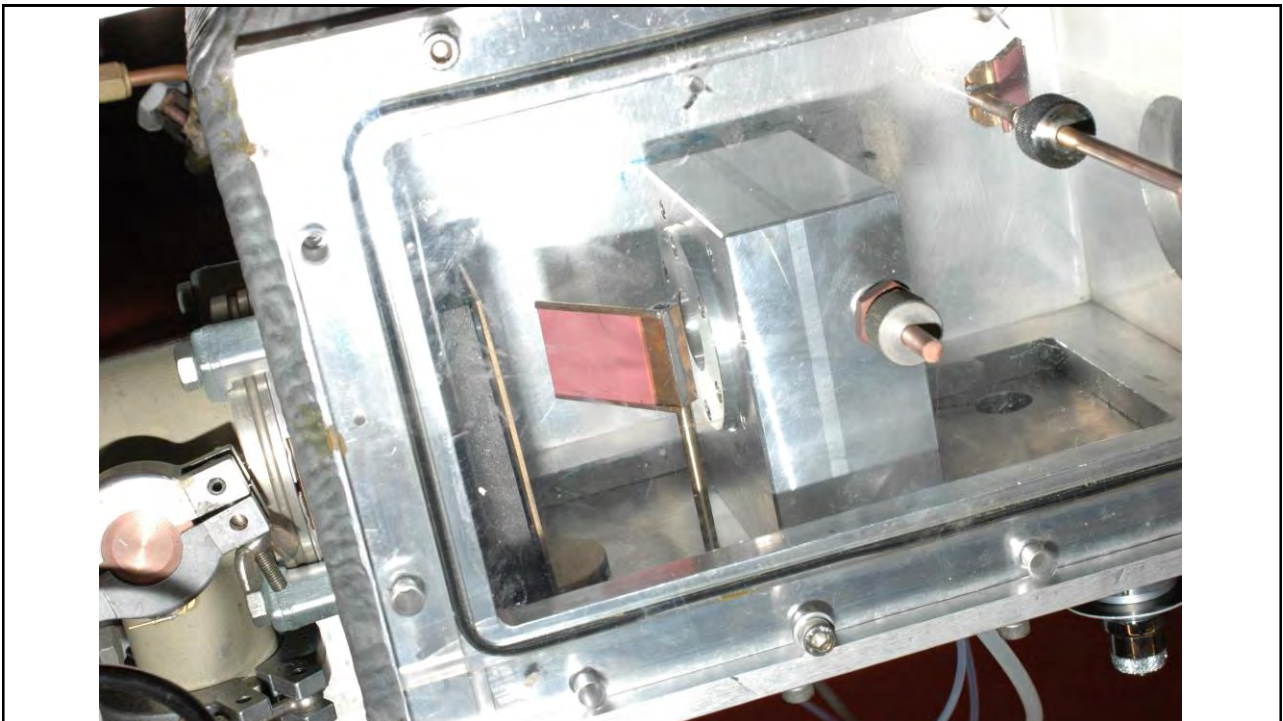
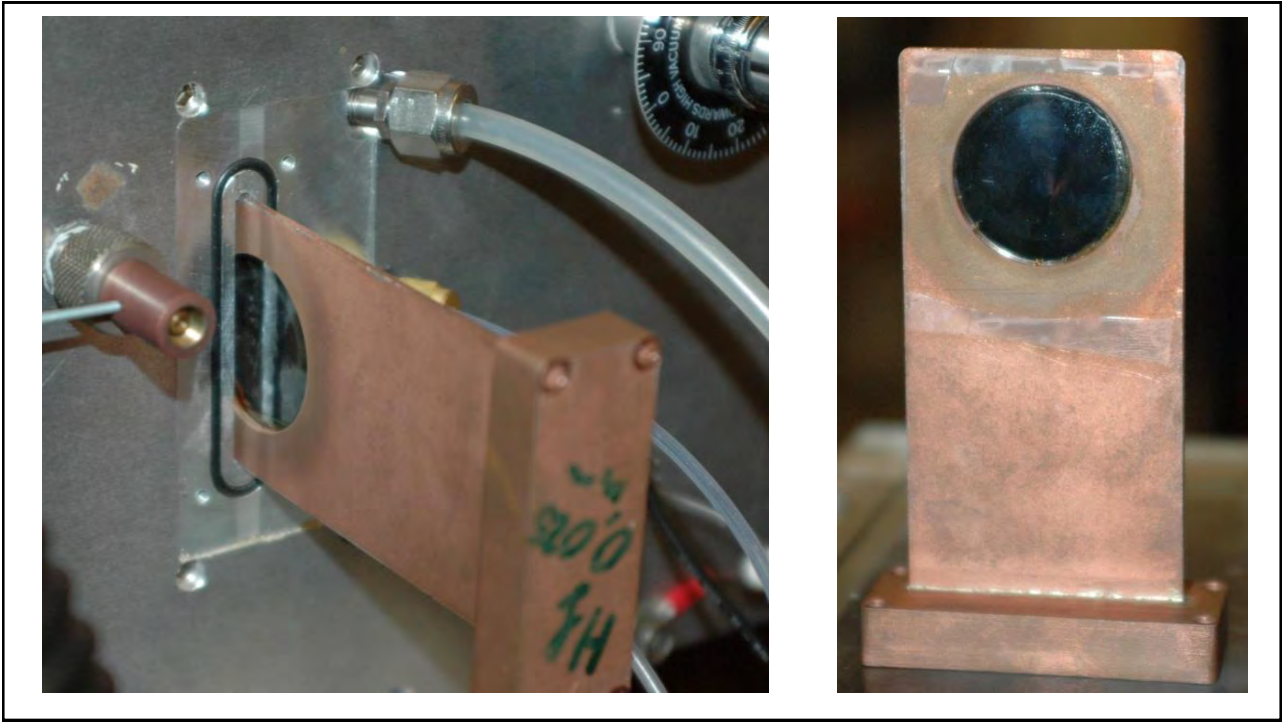
About U120:

http://www.ujf.cas.cz/index.php?option=com_flexicontent&view=items&id=67

New Opportunities in Rez, Czech Republic

- In collaboration with **Prof. Jan John and colleagues at CTU, Prague** and **Ing. Jan Sturza and his colleagues at NPI, Rez** it was decided to set up the Oslo target chamber and gas-jet transport system in Rez.
- The Oslo target chamber was mounted at the U120 cyclotron and tested successfully in October 2016.





Typical Radionuclides from ^3He -beam

Target:	natYb	natLu	natZr	natHf
Main product:	^{169}Hf (3.3 m)	^{174}Ta (1.0 h)	^{90}Mo (5.7 h)	^{177}W (2.3 h)
Useful γ -ray:	493 keV	207 keV	257 keV	493 keV
Homologue of:	Rf	Db	Sg	Sg
Transport yield:	33%			65%
Count rate:	18.7 kcps		660 cps	7.8 kcps

47 MeV ^3He beam with intensities of about 250 nA was used for the tests.

The Future (in Rez)

- Beam time granted for next three years (2017-2019)
- Successfully tested ^3He beam with **51.8 MeV energy** recently (6.8 MeV more than was available in Oslo)
- Construction of a radiochemistry lab to accommodate "wet chemistry" work is expected in 2018
- Improvements to target and gas-jet system will be performed

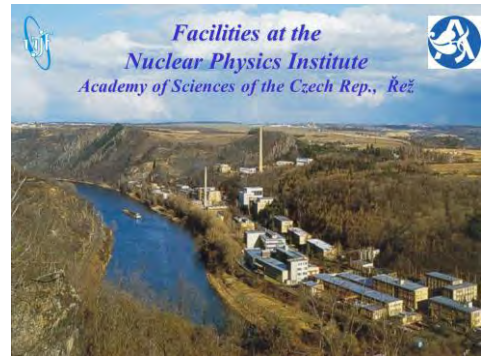


Planned Work

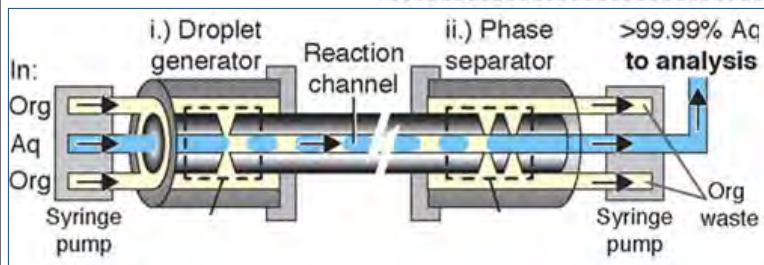
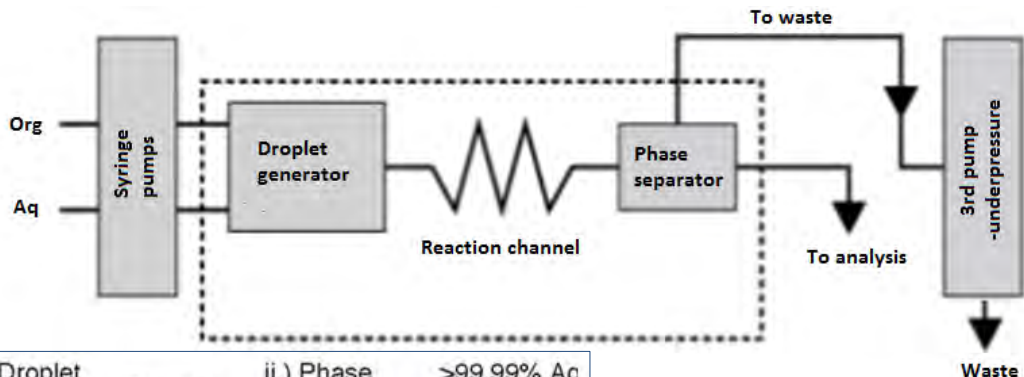
Target chamber/Gas-jet system at the U120 will be used to investigate new paths for performing aqueous phase-chemistry beyond Rf:

- Test of new micro-fluid device developed at CTU
- Test of membrane separators for use at RIKEN Sg experiment

Colleagues from SHE community welcome to use target chamber/gas-jet system. Might need to apply for beam-time separately.

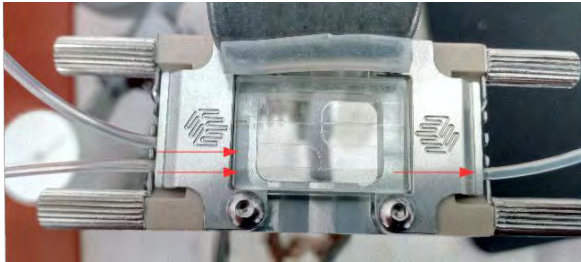


Slug-flow setup - for kinetic parameters measurements





**PHASE SEPARATOR (PTFE OR PVDF
HYDROPHOBIC/HYDROPHILIC MEMBRANE + UNDERPRESSURE)**



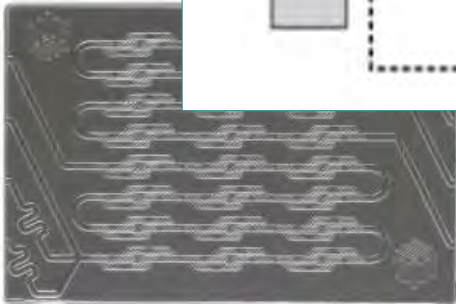
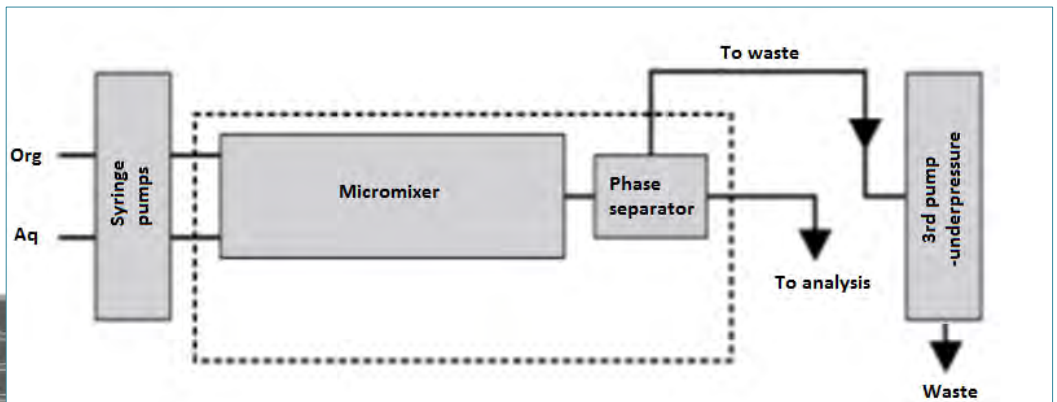
DROPLET GENERATOR (GLASS T-JUNCTION)



**SYRINGE PUMP (6-CHANNEL VALVE,
VOLUME ADJUSTABLE BOTH BY SYRINGE
AND SOFTWARE)**

TUBING (HYDROPHILIC FEP, INNER DIAMETER OF 250 MICRONS)

Micromixer setup - for equilibrium separation



**MICROMIXER (12-STAGE GLASS MICROMIXER,
TWO MICROMIXERS ON 1 CHIP)**

That's all folks – thank you!



RTC window supported by piano wire,
In SISAK LBNL experiment in 2000.