

ChemSep02

Workshop on

Recoil Separator for Superheavy Element Chemistry

March 20 - 21, 2002, GSI, Darmstadt, Germany

Scope

The main focus of this workshop will be:

- To discuss and find the design of a recoil separator which fits best the needs for a pre-separator coupled to superheavy element chemistry.
- To establish an international community among interested experts in the fields of separator design, atomic - and nuclear physics and nuclear chemistry to design, build, test and operate such a recoil separator in combination with superheavy element chemistry.

Background

The idea of the workshop originates from the success of superheavy element chemistry, which has now reached Hassium, element 108, with cross sections of a few pb and the insight that, presumably, a wide range of chemical investigations of elements 110 to 114 will require a physical pre-separation of the reaction products. Mandatory for such a separator will be, among other aspects, a very high transmission in combination with the use of thick actinide targets.

Topics

The following topics will be presented and discussed, and we ask for submission of contributions to these topics:

- Separation in vacuum (velocity filter, energy filter, ...)
- Separation in gas-filled separators
- Magnet designs and combinations

- Ion source and accelerator developments
- Window and target designs for high intensity heavy-ion beams

- Nuclear structure and stability (half lives, decay modes)
- Nuclear reactions (fusion reactions, target-projectile combinations, cross sections, multi-nucleon transfer products, ...)

- Achievements and Perspectives in Superheavy Element Chemistry

Program

Wednesday, March 20, 2002 – MORNING

- 1.1 Welcome – W. Henning
- 1.2. Introduction, Idea and General Scope – A. Türler
- 1.3. Structure of Workshop – M. Schädel

2. Superheavy Elements

2.1. Fusion Cross Sections – chair: K.E. Gregorich

- 2.1.1. S. Hofmann - Cold and Hot Fusion Cross-Section Systematics
- 2.1.2. V.Yu. Denisov - Formation of Superheavy Elements in Heavy-Ion Reactions and Fusion Barriers
- 2.1.3. T. Schuck - Neutron Transfer Effects in Nuclear Fusion

2.2. Nuclear Stability and Decay – chair: A. Popeko

- 2.2.1. F.P. Hessberger - Nuclear Structure Investigations in the Region of Transfermium Elements
- 2.2.2. J.V. Kratz - An EC-Branch in the Decay of 27-s Db-263: Evidence for the new Isotope Rf-263

2.3. Chemistry I – chair: J.V. Kratz

- 2.3.1. H.W. Gäggeler - Introduction into SHE Chemistry
- 2.3.2. Ch.E. Düllmann - Chemical Identification of Hassium (Hs, Z = 108) and Prospects for Future Studies
- 2.3.3. A.Yakushev - First Chemistry Experiments with Element 112
- 2.3.4. S. Soverna - Prospects for IVO Chemistry Experiment with Element 112
- 2.3.5. A.Yakushev - Approaches to Element 114 Chemistry with and without Physical Preseparation

Wednesday, March 20, 2002 - AFTERNOON

2.3. Chemistry II - chair: H.W. Gäggeler

- 2.3.6. R. Dressler - Limitations of Online Gas Chemistry Technique to alpha-spectroscopy in Ca-48 induced SHE Applications
- 2.3.7. U.W. Scherer - Development of Miniaturized Aqueous Chemistry Systems
- 2.3.8. R. Eichler - Vacuum Thermochromatography - Revival of a Gas Phase Adsorption Separation Method to be Coupled to a Future "CHEMSEP"
- 2.3.9. J.P. Omtvedt - Practical Results from Working with Preseparated 257Rf
- 2.3.10. C. Laue - Recoil Separator - Curse or Promise for SHE One-Atom-at-a-Month Chemistry

2.4. Ion Traps etc. – chair: N. Trautmann

- 2.4.1. A. Dretzke - Ion Chemical Reactions with Heavy Elements in the Gas Phase
- 2.4.2. M. Sewtz - Ion Mobility Measurements in the Region of Superheavy Elements with $Z \geq 100$
- 2.4.3. C. Weber - FT-ICR: A Non-Destructive Detection Method for Heavy Radionuclides at the SHIPTRAP Facility at GSI

3.1. Ion Source, Targets, Windows, etc. – chair: R. Loughheed

- 3.1.1. V.Ya. Lebedev - Conversion of some Neutron-Excess Isotope Chemical Forms available at the Market into Compounds suitable for Effective Feeding of a Cyclotron ECR Ion Source for Production of Highly Intense Ion Beam
- 3.1.2. K. Eberhardt - Preparation of Lanthanide and Actinide Targets for the new GSI Rotating Wheel Target Assembly
- 3.1.3. B. Kindler - Status of the Target Development and Target Monitoring at SHIP
- 3.1.4. J. Uusitalo - Window-less Operation of the JYFL Gas-filled Recoil Separator RITU

Thursday, March 21, 2002 - MORNING

4. Recoil Separators – Design and Achievements – Merits and Deficiencies

4.1. Velocity- and Energy Filters (separation in vacuum) – chair: C. Davids

4.1.1. D. Ackermann - The Velocity Filter SHIP

4.1.2. A.V. Yeremin - Design and Performance of Vassilissa Separator

4.1.3. C. Stodel - Experiments on Super-Heavy Elements with the Velocity Filter LISE III
= CANCELLED =

4.1.4. F. Scarlassara - The Heavy-Ion Magnetic Spectrometer PRISMA

4.2. Gas-filled Separators – chair: S. Hofmann

4.2.1. M. Leino - Transmission of the JYFL Gas-filled Recoil Separator RITU

4.2.2. J. Wild - The Dubna Gas-filled Separator - Status Report

4.2.3. K. Gregorich - The Recoil Transfer Chamber: A Gas-Jet Transport Device Coupled to the Berkeley Gas-filled Separator

5. New and Old Ideas, Concepts and Designs (related to a “CHEMSEP”) – chair: M. Leino

5.1.1. R.N. Sagaidak - Angle- and Energy Selection of the Heaviest Evaporation Residues Produced in Complete Fusion Reactions

5.1.2. C.N. Davids - Design Study for a Recoil Separator for Superheavy Element Chemistry

5.1.3. O.N. Malychiev - Electrostatic Preseparation for Chemistry of Superheavy Elements

5.1.4. A. Popeko - Gas-filled Magnet as Preseparator for Chemistry

5.1.5. T. Enquist - About the Design of a Gas-filled Separator

5.1.6. K. Gregorich - A Superconductor Gas-filled Separator

5.1.7. U. Köster - Experiments at ISOLDE with Homologs of the Elements 104 - 118

Thursday, March 21, 2002 - AFTERNOON

6. Concluding Discussion – Panel and Audience – chair: G. Münzenberg

6.1. Open Questions - moderated by Panel Chairperson

6.2. Most Promising Design(s) - moderated by Panel Chairperson

6.2.1. Gas-filled Separator vs Vacuum In-flight Separation

6.2.2. Design Parameters

6.3. What to do (test exp., calculations) ? – Who, when , where, ...?

6.4. Proposal to GSI, ... ? – Who, when, what, how, ..?

7. Concluding Remarks – M. Schädel, A. Türler