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Ion catchers for short-lived isotope research: Challenges, concepts and applications

Thursday, 6 October 2022 09:00 (30 minutes)

Ion Catchers are gas-filled chambers to thermalize fast ion beams and convert them into low-energy beams. The origin of this is the IGISOL facility in Jyväskylä, Finland. There, the method of thermalizing short-lived nuclides in helium gas was pioneered more than three decades ago. Large volume Ion Catchers are today operated at many exotic ion beam facilities worldwide. They are used to thermalize exotic nuclides produced in fusion, in-flight fragmentation and fission, spontaneous fission, and multi-nucleon transfer reactions. The method is appealing as it is universal and applies to refractory elements. After the thermalization in the high-density buffer gas, typically helium, the ions are extracted and separated from the gas to form a “cold,” low-energy beam of short-lived nuclides. This beam is further prepared (e.g., mass selection, dissociation of molecules) before it is delivered to high-precision experiments, such as mass spectrometry, mass-assisted decay, and collinear laser spectroscopy. Ion Catchers are also used for cooling exotic nuclides before re-acceleration to Coulomb barrier energy for reaction studies.

Each application or production method has its specific needs and challenges. Still, it is typically the quest to maximize the rate capabilities and stopping efficiency while having extraction times well below 50 ms to access the most short-lived nuclides and isomers. The presentation will give an overview of the state-of-the-art concepts developed to meet these challenges, recent highlights and achievements, and future perspectives.

Presenter: Prof. DICKEL, Timo

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