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(Zoom) The Superheavy Nuclei: Fusion and Fission

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Superheavy nuclei (SHN) with extremely large amount of nucleons (e.g., protons up to Z = 126) are still one of the main subject in nuclear physics 1. The main purpose of this research is to examine the fission-stability of SHN at around Z = 114 – 126 and N = 184, where occurrences of next closed shells are theoretically expected [1].

To date, SHN with Z up to 118 (Og, Oganneson) are known [2,3]. They were synthesized mostly in 48Ca-induced fusion reactions with atom-at-a-time rates. A current hot topic is the synthesis of superheavy elements beyond Og, for which one has to employ fusion reactions with projectile nuclei heavier than 48Ca [4].

The experimental data, e.g., partial spontaneous fission half-lives of the known SHN, confirm the concept of the island of stability. However, fission properties (fission hindrance, fragment mass distribution, etc.) are still poorly studied [5]. This situation stems mostly from a lack of comprehensive experimental data on fission.

I will discuss the above-mentioned two topics and present the related recent experimental findings at the gas-filled recoil separator TASCA, GSI (e.g., [4,6]) and the Heavy Ion Accelerator Facility of the ANU, Australia (e.g., [7]).
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Email Address

Presenter if not the submitter of this abstract

Presenter: JADAMBAA, Khuyagbaatar (GSI Helmholtzzentrum für Schwerionenforschung)

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