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On the properties of superheavy nuclei

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Superheavy nuclei (SHN) with extremely large atomic numbers (Z > 103), whose existence is due to their underlying nuclear stucture, remain one of the central and interdisciplinary research topics in science [1].

To date, SHN with proton numbers up to Z = 118 and neutron numbers up to N = 177 have been successfully synthesized and identified [2,3]. These nuclei are produced in heavy-ion induced fusion reactions at atom-at-a-time production rates and are identified through their α-decay chains and spontaneous fission.

Experimental data on the partial half-lives of α-decay and spontaneous fission confirm the enhanced fission stability of SHN thanks to their nuclear structure. However, many important properties (fission hindrance, fragment mass distributions etc.) of fission from SHN remain largely unexplored experimentally. These properties are essential for improving theoretical descriptions of the highly complex fission process within semi-empirical, macroscopic–microscopic, and fully microscopic approaches.

Intensive research programs dedicated to probing the shell structure and fission stability of SHN are ongoing worldwide, including efforts within the SHE Chemistry Department at GSI, Germany [4,5].

I will present/discuss the recent progress on the fission properties of SHN.

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[3] Yu.Ts. Oganessian et al., Phys. Rev. C 106, 064306 (2022).
[4] J. Khuyagbaatar, et al., Phys. Rev. Lett. 125, 142504 (2020), Phys. Rev. C 104, L031303 (2021), Phys. Rev. C 106, 024309 (2022), Phys. Rev. C 109, 034311 (2024), Phys. Rev. Lett. 134, 022501 (2025).
[5] P. Mosat et al., Phys. Rev. Lett. 134, 232501 (2025).

Type of contribution

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