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Present and future studies of Superheavy Nuclei

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The production and spectroscopic study of the heaviest elements has always been a central theme of nuclear physics. In recent years, a wealth of new data has been produced, both in terms of new elements (up to Z=118 [1]) and in detailed spectroscopic studies of nuclei with masses above 240 [2]. Such studies provide data concerning nuclear parameters such as masses, decay modes, half-lives, moments of inertia, single-particle properties, etc., in systems with the highest possible number of protons. The main focus of current experiments is the search for the next closed proton- and neutron- shells beyond the doubly magic 208Pb.
This search can be made directly, by producing nuclei in the region of interest (Z>112 and N>176), or indirectly through the study of lighter deformed nuclei where the orbitals of interest at sphericity are active at the Fermi surface.

The advent of next-generation radioactive beam facilities will begin to provide reasonably intense beams of exotic nuclei. Whilst the intensities are not expected to be at the level used in current stable beam facilities, the beams still offer a opportunity to extend studies of superheavy nuclei. Neutron-rich beams will provide a method to populate isotopes not accessible by any other means. The use of more symmetric reactions will allow nuclei in the region of 254No to be populated at higher spin and excitation energy than currently possible. New opportunities to study reaction dynamics with exotic neutron-rich beams will also provide interesting data. The use of deep inelastic collisions with neutron-rich beams may also be of interest.

Examples of recent highlights in heavy element studies with stable beams, along with the opportunities provided by future facilities to extend these studies will be presented.

[1] Yu.Ts. Oganessian et al., Phys. Rev. C 74, 044602 (2006).
[2] R.-D. Herzberg and P.T. Greenlees, Prog. Part. Nucl. Phys. 61, 674 (2008).

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