

STATUS AND PERSPECTIVES OF SUPERHEAVY ELEMENT RESEARCH AT GSI

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The synthesis and investigation of superheavy elements (SHE) was a driving force for the foundation of the GSI in Darmstadt, Germany fifty years ago. Around that time, it had been predicted that superheavy elements in the region of $Z \approx 114$ and $N \approx 184$ should exist and form an island of stability. Since then, several new elements were synthesized in worldwide efforts and the 7th row of the Periodic Table was recently completed. Nonetheless, we are still trying to answer the question what the heaviest element will be.

As SHE owe their existence to nuclear shell effects detailed investigations of their nuclear structure are of prime interest. To this end, nuclear spectroscopy and high-precision mass measurements can be employed. In addition, the atomic and chemical properties of SHE may differ from lighter elements due to an increasing impact of relativistic effects. This can be studied by chemical methods and through laser spectroscopy.

At the GSI in Darmstadt we perform a comprehensive research program looking at all these different facets of SHE. Recently several breakthroughs have been achieved. For example, direct mass measurements of nobelium and lawrencium as well as the first optical spectroscopy of nobelium have been achieved.¹⁻⁴ These experiments shed light on the strength and extension of nuclear shell effects, the occurrence of low-lying isomeric states, and the shape and deformation of the heaviest nuclei.

In my contribution, I will summarize the present status and discuss select recent results from the latest beamtime campaign at GSI.

References

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