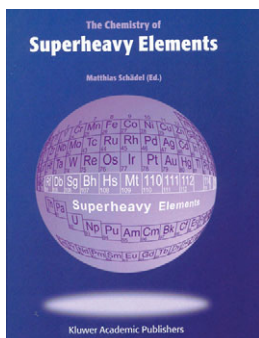


Atomic, Electronic

Greg Choppin*



The Chemistry of Superheavy Elements

Edited by
Matthias Schädel
Kluwer 2003, 300 pp.
ISBN 1-4020-1250-0
Hardcover, €138.00

It is noted in the preface that this book is intended for students in this field as well as for active scientists. It is also intended to be of interest to other teachers and other chemists and physicists who are not experts in the field. As a result there is somewhat a mixture of rather detailed descriptions of experiments and data analysis combined with quite qualitative reviews of various aspects in the superheavy element (SHE) field. In general the chapters are well written both in sections that provide detailed information as well as in more general sections.

Chapter 1 provides discussion of the nuclear aspects of the SHEs with a good historical overview. After a brief discussion on experimental techniques, there is an interesting discussion on the 'Cold-Fusion and the Hot-Fusion' reactions. This would also be of interest to non-experts who have some knowledge of nuclear reactions. Chapter 2 discusses the electronic structure of the SHEs and perturbations in these structures due to relativistic effects. Included is a calculation of the estimates of covalency in various types of bonds of the SHEs as well as various factors expected to be involved in the aqueous chemistry of these elements.

The focus in Chapter 3 is on fundamental aspects of single atom behaviour. An interesting discussion covers macro versus micro single-atom effects and how estimates for chemical properties can be made both for the dynamics and kinetics of such systems. Chapter 4 covers experimental techniques. This chapter would be of less interest to general scientists but of considerable interest to SHE experts.

Chapter 5 is basically a review of liquid-phase chemical studies of the first two transactinide elements. The detailed discussion of the experiments on these two elements reflects the difficulties in single atom experiments and addresses the instances where erroneous conclusions were made in regard to interpretation of the chemistry. The degree of detailed descriptions of the experiments in this chapter is greater than in the other chapters and would be of interest only to experts working in these systems. By contrast, Chapter 6 on basic principles of the gas-phase studies of the SHEs serves as

a good introduction to Chapter 7 which provides detailed descriptions of the experiments.

The final chapter, 7, is entitled, 'Historical Reminiscences'. For the non-expert, this is perhaps the most interesting chapter of the book as it is an excellent review of the attempts to make the superheavy elements of atomic number $Z \geq 118$. It would be of interest to teachers of nuclear science who would wish to discuss the superheavy elements and the frustrated attempts to reach the 'island of stability'.

In summary this is an interesting book and a useful addition to the literature. It meets its goal of providing sections of detailed interest to researchers in the field of the SHEs as well as of providing less detailed but interesting reviews for the more general scientific readers.

**Greg Choppin was a researcher in Glenn T. Seaborg's new element group at Berkeley (1953–1956) during which he was a codiscoverer of element 101 'mendelevium' and had begun initial work on element 102 'nobelium'. He then joined the faculty at the Department of Chemistry and Biochemistry, Florida State University, where he has remained. His career, producing more than 400 research papers, has concentrated on the nuclear and chemical aspects of the actinide elements.*