MHD instabilities and macroscopic properties of tokamaks. The presentation is done at a fairly low level of mathematics and could easily be used as a textbook for an advanced undergraduate or beginning graduate level course.

F. L. Cochran (PhD, plasma physics, University of Maryland, 1978) has been at the University of Arizona since January 1979. His interests are in MHD theory and computational hydrodynamics. At present, he is working on the development and application of hybrid numerical simulation codes for the treatment of various nuclear fusion systems.

Superheavy Elements

(Proceedings of the International Symposium on Superheavy Elements)

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Reviewer	Glenn T. Seaborg

This volume consists of the 50 papers presented at the International Symposium on Superheavy Elements held at Texas Technological University, Lubbock, Texas, in March of 1978.

Superheavy Elements (SHE) is the name that is used to denote elements that are well beyond the upper limit of the present Periodic Table and are expected to have their nuclei stabilized (i.e., have their half-lives for radioactive decay increased) by the advent of closed proton and neutron shells. The consensus is that the most hopeful region, termed an "Island of Stability," is located in the neighborhood of 114 protons and 184 neutrons. Calculations based on the extrapolation of known nuclear energy levels and various theories of nuclear structure indicate increased half-lives in this region that would make it possible to detect such radioactive nuclei (through their decay via high-energy alpha particles or spontaneous fission) provided they could be produced by transmutation reactions (through the use of heavy ions). Some predictions have even suggested half-lives as long as 10^8 yr, sufficient to allow the presence of SHE in nature.

The volume starts with an excellent overview paper by O. Lewin Keller, Jr., that describes the history and perspective of the search for SHE and includes a discussion of SHE's predicted chemical properties and place in the Periodic Table. This is followed by papers that describe the thus far unsuccessful attempts to synthesize and detect these elements through the use of heavy-ion accelerators at the GSI Laboratory in Germany and the Lawrence Berkeley Laboratory in the U.S.

Numerous papers describe the unsuccessful searches for SHE in nature. Of special interest are the papers that concern themselves with the somewhat mysterious long-range alpha-particle emitters, including radiohalos, associated with various natural radioactive sources. The question has been raised as to whether these phenomena might be associated with SHE, a possibility that this reviewer thinks is unlikely. This volume presents the best available single source of information on this interesting field of investigation.

Several papers deal with the predictions of half-lives for SHE. The best predictions appear to be those that suggest that these are too short to allow the presence of SHE in nature. Interesting predictions include the possibility of peculiar shapes for the nuclei of SHE, such as toroidal, spherical bubble, or crystalline, that might enhance their stability.

Most of the predictions suggest half-lives sufficiently long to allow their detection if reactions for their synthesis with sufficient yields could be found. Fusion reactions of moderately light heavy ions (such as ^{48}Ca) with heavy target nuclei (such as ^{248}Cm), or deep inelastic transfer reactions involving the heaviest available heavy ions and target nuclei (such as ^{238}U and ^{248}Cm) perhaps offer the most hope. However, the high bombarding energies required for the fusion reaction (resulting in loss of the product via the fission reaction) and the limited exchange of nucleons apparently possible (and the loss via fission) in the deep inelastic transfer reaction reduces our optimism for success.

Whether or not SHE are ever found, the stimulus of this concept has resulted in much worthwhile research and many interesting results. This volume presents a good picture of the present status of this research.

Dr. Glenn T. Seaborg is professor of chemistry and associate director of the Lawrence Berkeley Laboratory at the University of California, Berkeley. In 1940 and 1941, plutonium became the first of ten transuranium elements to be discovered by Dr. Seaborg and his coworkers. In 1951, at the age of 39, Dr. Seaborg was awarded the Nobel Prize for Chemistry (with E. M. McMillan) for his work on the chemistry of the transuranium elements. In addition to the Nobel Prize, Dr. Seaborg has received numerous awards and honors for his contributions to scientific discovery, education, the public understanding of science, government service, and international cooperation.