

MOLTEN SALT THERMOCHEMICAL DATABASE (MSTDB) TO SUPPORT REACTOR DESIGN AND SIMULATION

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To aid in the design, operation, and licensing of generation IV molten salt reactors, a freely accessible molten salt thermochemical database (MSTDB) is currently under development. Applications include prediction of melting temperature, stable phases, precipitate phases, activities, vapor pressure, and specific volume. The database will provide validated thermodynamic data and models for pure compounds, liquid melts, solid solutions, and metal dissolution of fluoride and chloride-based molten salt systems including consideration of corrosion and fission products. Molten salt reactors experience complex and dynamic changes in fuel composition. Therefore, in order to achieve accurate predictions, the coupling of a comprehensive database with complete thermodynamic models is required. The MSTDB utilizes published work as well as original system assessments, complete with documented sources and uncertainties (where applicable). The database is intended to be freely available through a project website managed by Oak Ridge National Laboratory. The format of the database will be compatible with common commercial and open-source thermodynamic software. Integration with the BISON fuel performance code has been accomplished, with MSR-specific codes also expecting to utilize thermochemical modeling. In addition to nuclear applications, the MSTDB can be used for systems in which constituent molten salts are used for heat transfer and/or storage.

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