INTRODUCTION TO THE MOLTEN SALT CHEMISTRY AND TECHNOLOGY SPECIAL ISSUE

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The scope of the Molten Salt Chemistry and Technology Symposium, held in August 2005 in Toulouse, France, covers the low-temperature ionic liquids up to the high-temperature molten salts. State-of-the-art applications have been presented and discussed (batteries, nuclear energy, pyrochemical reprocessing of spent nuclear fuel, synthesis, catalysis, etc.). A special session for nuclear energy applications was organized. This special issue of *Nuclear Technology* presents the most interesting papers from that symposium.

Molten salt systems can be used in reactors as a fuel itself, as a primary coolant or as a heat transfer, and also to recycle spent fuels. All of these applications are described in the Generation-IV (GEN-IV) system research plan of the molten salt reactor, one of the six selected systems in the frame of the GEN-IV forum.

Molten salt technology is already used in industrial scale, mainly for aluminium or zirconium production. Nuclear systems will require different salts compared to these mature industrial applications. The main salt under study is fluorides for the reactors and the reprocessing. Chlorides are also studied and are applied for the spent-fuel reprocessing in the United States. Nitrate or carbonate salts are also considered as a heat transfer media or for reprocessing.

For recycling, different partitioning processes can be foreseen to separate actinides and fission products such as volatilization, distillation, fluoration, electrolysis, liquid metal extraction, oxidation, etc. These processes are often called pyrometallurgical processes, in opposition to the industrial hydrometallurgical ones, because of the high temperature conditions for molten salt.

Therefore, potential use of molten salt technologies or processes in nuclear systems is wide.

Three papers in this special issue introduce the different applications for reactors (by D. F. Williams and K. T. Clarno, E. Merle-Lucotte et al., and P. M. Bardet and P. F. Peterson); they present the needs and a preliminary selection of salts that can be applied to different molten salt systems (fuel or coolant). The other papers are devoted to the separation processes that can be applied to spent fuels: actinide and fission product precipitation (by T. R. Griffiths and V. A. Volkovich), electrolysis on a solid metal (by A. F. Laplace et al.), and liquid metal extraction (by S. Delpech et al.).

These papers are certainly not representative of the entire research and development performed in the national laboratories or by the industry. But, they give a good overview of the molten salt possibilities in the different fields of nuclear systems, and they provide good understanding, data, and references for future work.

We hope that this special issue will be a valuable contribution, and we express our thanks to the organizers, reviewers, and authors for their patience and efforts in preparing it.