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Preface

The Seminar on European Research on Materials for Transmutation (ERMT) is an initiative of the EFTTRA group. EFTTRA, which is the acronym for Experimental Feasibility of Targets for Transmutation, is a network of research organisations in France (CEA, EdF), Germany (FZK) and the Netherlands (NRG), and European Commission Institutes (JRC-IE, JRC-ITU) and was formed in 1992. The goal of EFTTRA is the study of the transmutation of actinides and long-lived fission products. The activities are focused on the development and testing of targets and fuels, taking into account the scenarios developed in Europe for possible Partitioning and Transmutation (P&T) strategies. For this purpose fabrication routes are being investigated, irradiation tests are performed, and post-irradiation examinations are made in the various facilities of the EFTTRA partners.

The ERMT Seminar series was started to exchange information and ideas with other research organisations in this field. The first ERMT Seminar was organised by CEA in Cadarache in 1999 and dealt with aspects of the development and characterisation of transmutation fuels and targets. Specialists in the field were invited to give an overview of the state of the art of selected topics relevant to materials for transmutation. The same approach was adopted for ERMT-II and scientists from Europe and Japan presented and discussed the latest developments in the field during two days in Karlsruhe.

In this issue of Journal of Nuclear Materials the lectures presented at ERMT-II are collected. They cover research fields comprising fabrication technology, thermophysical properties, irradiation experiments and strategies, and addressing both transmutation fuels and targets. The reader will notice that, depending on the fuel cycle strategy, several materials are being investigated as matrix for actinide transmutation. A number contributions report results of irradiation experiments that address the behaviour of $MgAl_2O_4$ spinel. In the mid 1990s, when most of these experiments were initiated, this was a main candidate for once-through scenarios. Though the irradiation results are not very promising, much has been learned, and the attention has shifted in recent years to zirconia-based and composite materials with tailored design to deal with specific attributes of transmutation targets, such as the helium production. This is strongly reflected in the contributions on fabrication technology and thermophysical properties.

During the closing discussion the significant amount of research still needed to develop and qualify transmutation fuels and targets was addressed. Such research will probably stretch over a significant time period, especially due to the time-consuming in-pile testing of these materials. For this purpose a knowledge database on the properties of virgin and irradiated materials should be established. It was also stressed that this is not possible without maintaining a significant nuclear infrastructure (fabrication laboratories, reactors, hot-cells). In this context the Institute for Transuranium Elements was glad to be able to show the participants the newly-built Minor Actinide Laboratory for fuel and target fabrication, whose construction is reaching its final stage. In addition to 'hardware', it was also recognised that the interest of young scientists is needed in the coming decades. The papers collected in this issue demonstrate the scientific and technological achievements so far and the challenges ahead.

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