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INTRODUCTION

Recent achievements on the scientific basis for nuclear waste management

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The safe management of nuclear waste is one of the great scientific and societal challenges of the twenty-first century. The Scientific Basis for Nuclear Waste Management (SBNWM) symposia, originating from the Materials Research Society (MRS) meeting in 1978, address fundamental and applied material science aspects in the context of nuclear waste management. This symposia series provides an ideal platform for experts and young scientists from international research and waste management organizations to exchange information on recent developments of research related to the safe management and disposal of nuclear wastes.

Within this special issue, snapshots of work in progress on key topics presented at the SBNWM2021 symposium are published representing an impressive overview of the excellent and manifold work that is conducted in this challenging and important field of research despite the difficult and inhibitive pandemic situation.

The articles of this special issue focus on key scientific challenges for the safe treatment and disposal of nuclear waste. The main block of articles is dedicated to the development and characterisation of waste forms, such as zirconolite ceramics (Aldean et al. [1]), monazite glass–ceramics (Bailey et al. [2]), and glass (Harnett et al. [3] and Lere-Adams et al. [4]). To some extent geopolymers (Kearney et al. [5]) and sodalite-type waste forms (Bollinger et al. [6]) are designed for the immobilization of specific radionuclides or waste streams (Harrison and McKendrick [7]). Ferrand et al. [8] and Schreinemachers et al. [9] describe the chemical stability of SM 539 glass and spent oxide fuels under hyperalkaline and repository relevant conditions, respectively, while Idemitsu et al. [10] address the migration of neptunium in bentonite. Additionally, new insight into structural effects of uranium compositions (Weber et al. [11], Potts et al. [12], and Krot et al. [13]) as well as into the stability of microparticulate uranium oxide reference materials (Potts et al. [14]) are offered. Furthermore, very interesting calculations with regards to the effects of burnup on waste loading (Sakuragi et al. [15]), heat generation (Hamada et al. [16]) as well as of temperature on swelling stress of buffer material (Sato [17]) are demonstrated. Finally, Miwa et al. [18] and Doblin et al. [19] inform about novel approaches on dose evaluation methods and production of corrosion resistant canister coatings.

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Stefan Neumeier (Guest editor).

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