

Over View Report 1 MEXT's Nuclear Joint Research Collaboration

Advanced Waste Management Strategies for High Dose Spent Adsorbents

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Following the accident at the Fukushima Daiichi nuclear power plant, the process of stabilizing reactor units 1,2 and 3, needed large volumes of water for cooling which became contaminated with radionuclides. This water has been stored at the Fukushima site in order to prevent environmental harm. In the intervening years significant effort has been put into removing these nuclides using multiple water treatment facilities. This has, however, resulted in large quantities of high dose adsorbent ceramic adsorbent granules. The work presented here describes a collaboration between Kyushu University in Japan and the University of Sheffield and Imperial College London in the UK to develop wasteforms suitable for the immobilisation and eventual disposal of these highly active adsorbents.

Each institution has developed their own wasteform concept. At Kyushu, glass additives mixed with the adsorbents have allowed the production of a monolithic borosilicate vitrified wasteform with a processing temperature of 1050°C. Imperial College produced a glass-ceramic composite in which adsorbent granules are encapsulated by low softening glasses from the lead-borate and lead-borosilicate systems. This gives a material with a particularly low processing temperature (<600°C) minimising any volatilisation of sorbed radionuclides such as Cs. The University of Sheffield used hot isostatic pressing of the adsorbents to produce a polyphase ceramic wasteform.

The processing routes and wasteform performance will be compared for the three waste concepts with special emphasis given to Cs volatilisation, waste volume reduction, durability and wasteform heating for each.