Development of Glass Composite Wasteforms for Spent Adsorbent Wasteforms for Zeolite

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Large volumes of spent adsorbent have been produced. Due to volatilisation concerns of Cs and Sr a low temperature immobilisation process is sought to permanently dispose these spent adsorbents. A commercial chabazite was used as a model waste and an immobilisation process using lead borate (PB) and lead borosilicate (PBS) low melting temperature glass compositions was designed to form durable Glass Composite Material (GCM) wasteforms. The results, with up to 40 wt.% waste loading in PBS and 30 wt.% in PB, at a maximum temperature of < 600°C are presented here.

Keywords: vitrification, low melting glass, adsorbent

1. Introduction

There is no experience for treatment of high dose spent adsorbent which includes radioactive Sr and Cs.[1] In this collaborative project between Imperial College London and Hitachi Ltd. Japan a suitable wasteform is being developed.

2. Experimental

PBS and PB glasses were sintered with 10-40 wt.% calcined commercial chabazite under various temperature/time (T/t) profiles in air and densified by a viscous flow mechanism. Microstructures were examined by SEM/EDS to confirm densification of the produced wasteforms.

3. Results-Conclusion

Both PB and PBS simulant wasteforms were produced at temperatures below 600°C which should ensure retention of Cs and Sr. Careful control of the T/t profiles was needed to prevent sealing off of the wasteforms by formation of a glaze coating, and so enable release of volatile species and avoidance of bloating. PBS wasteforms were loaded with up to 40 wt.% chabazite and showed dense final microstructure (Figure 1). PB wasteforms were loaded with up to 30 wt.% chabazite and sintered. PB wasteforms showed signs of foaming (Figure 2), despite strict T/t control. Work continues to improve densification on the PB wasteforms. The initial results reveal this is a promising route for processing of spent adsorbents and confirms that low temperature immobilization of volatile radwaste is possible.

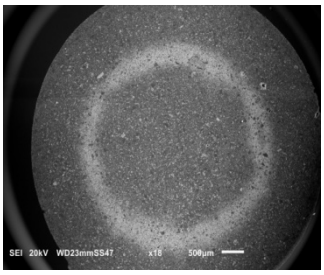

Figure 1 Cross-sectional SEM micrograph of a pellet of 40 wt.% chabazite in PBS showing a dense microstructure

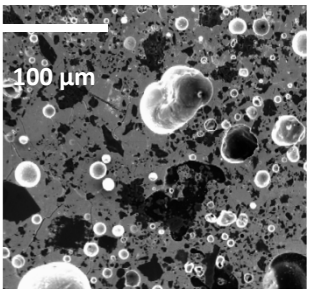

Figure 2 Cross-sectional SEM micrograph of a pellet of 30 wt.% chabazite in PB showing a foamed microstructure

[1]Yasuaki Miyamoto: R&D on the Radioactive Waste Treatment and Disposal, Symposium of IRID, http://irid.or.jp/wp-content/uploads/2014/07/Sympo_Miyamoto_J.pdf