

Durable Technetium Wasteforms and the Challenges They Pose

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Technetium is the lightest element which has no stable isotope. It is of major importance in nuclear medicine (over 80% of all radiopharmaceuticals in the world are labelled with ^{99m}Tc). ⁹⁹Tc is a long life ($t_{1/2} = 2.1 \times 10^5$ years) β -emitter formed during the fission of U and is a major concern for radioactive waste disposal. The two most common valence states are 4⁺ and 7⁺, with 7⁺ being known to be highly mobile in the environment. The stability of Tc in waste form materials is of paramount importance for long-term storage. In the last ten years, the development of facilities and techniques appropriate for beta-emitting radionuclides has resulted in the synthesis and analysis of a variety of new Tc-containing oxide materials.

Recently we reported both the structural and magnetic details of the perovskite SrTcO₃ and CaTcO₃ [1,2]. The issue with this material is that it must be formed at relatively low temperatures and thus it is not very crystalline or dense and so not a suitable wasteform. This presentation will cover recent developments in this area and possible ways forward in wasteform development.

[1]. Rodriguez, E.E., et al., Phys. Rev. Lett., 2011, 106(6).

[2]. Avdeev, M.; et al., J. Am. Chem. Soc. 2011, 133, (6), 1654-1657.