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Thorium incorporation in phosphates matrices: the case of xenotime

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The management and the conditioning of radwaste represents a major challenge in the nuclear industry. Therefore a variety of host matrices have been studied, including several phosphate based ceramics.1 They represent promising candidates for the specific conditioning of actinides (III, IV) owing to their easy way of preparation and high chemical durability.2
The incorporation of actinides in such phases has been extensively studied through solid-state routes. Thus, it often requires repetitive grinding steps and re-heating to avoid the formation of heterogeneous compounds.3 For such reasons, the synthesis of target compounds in aqueous solution were developed to prepare pure and homogenous phases.
In this study, a particular attention was paid to the incorporation of tetravalent actinides (Th4+, U4+) in the zircon structure type through the coupled mixed (An(IV) + SiO4 / Ln(III) + PO4) substitution.
In this frame, solid solutions of Er-xThx(PO4)1-x(SiO4)x were obtained in application of the method developed to prepare pure coffinite (USiO4), i.e. hydrothermal conditions at 250°C for 7 days.4 The analysis of the PXRD data showed the formation of single phases. The structure crystallizes in the zircon-type structure (I41/amd group, tetragonal system) as observed for the end-members ThSiO4 and ErPO4. From Rietveld refinements, the formation of a complete solid solution was confirmed in agreement with the Vegard's law. A thorough analysis was also carried out by Raman spectroscopy and EXAFS at the Er and Th edges and showed an exciting structural evolution.5

References

1. Dacheux, N.; Clavier, N.; Robisson, A. C.; Terra, O.; Audubert, F.; Lartigue, J. É.; Guy, C. Comptes Rendus Chimie 2004, 7 (12), 1141-1152.
2. Dacheux, N.; Clavier, N.; Podor, R. American Mineralogist 2013, 98 (5-6), 833-847.
3. Terra, O.; Dacheux, N.; Audubert, F.; Podor, R. Journal of Nuclear Materials 2006, 352 (1), 224-232.
4. Mesbah, A.; Szenknect, S.; Clavier, N.; Lozano-Rodriguez, J.; Poinssot, C.; Den Auwer, C.; Ewing, R. C.; Dacheux, N. Inorganic Chemistry 2015, 54 (14), 6687-6696.
5. Mesbah, A.; Clavier, N.; Lozano-Rodriguez, M. J.; Szenknect, S.; Dacheux, N. Inorg Chem 2016, 55 (21), 11273-11282.

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