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A Novel Approach towards Synthesis of Apatite Based Ceramic Waste Forms for Immobilization of Radioactive Iodine (^{129}I)

Lead vanadate iodide apatite, $Pb_{10}(VO<sub4< sub="">)_6I_2$, has been synthesized by wet-chemical synthesis for the first time in reported literature. Several factors play a significant role in the synthesis: high solubility precursors, no heating, low pH with no addition of acids and bases, and ambient atmosphere. Solid solution characterization has been performed with the substitution of Ca for Pb and PO_4 for VO_4 with most notably NMR and Rietveld analysis. The apatite structure cannot accommodate certain thresholds of Ca and PO_4: Pb/Ca ratio less than 6/4 and a VO_4/PO_4 ratio less than 4.5/1.5. Further solid solution characterization is ongoing.</sub4<>