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Chemical and Physical Phenomenon Underlying Novel Low Temperature Pyrochlore Nanoparticle Synthesis MADHAB POKHREL, KAREEM WAHID, YUANBING MAO, Univ of Texas Rio Grande Valley — $A_2B_2O_7$ compounds have attracted considerable attention due to their potential applications in radiation-based environments. These compounds can crystallize in two forms, the ordered pyrochlore or disordered fluorite phase, which may alter their physical properties. While it is well known that $A_2B_2O_7$ compounds can be produced by a variety of synthesis methods, the molten salt method is particularly attractive due to its low temperature of synthesis, low cost, and ease of fabrication. In this study, we demonstrate that homogenous co-precipitation coupled to molten salt synthesis leads to the formation of nano-sized pyrochlore phase $RE_2Hf_2O_7$ (RE = La, Pr) at temperatures (650C) unobtainable by conventional solid-state synthesis of hydroxide precursors. This is compared with other $RE_2Hf_2O_7$ compositions (RE = Y, Gd, Er, Lu) that crystalize as disordered fluorites via both synthesis methods. A suite of characterization techniques, including X-ray diffraction, Raman spectroscopy, and scanning electron microscopy were employed to investigate the structural evolution of these nanoparticles. A mechanism has been proposed that elucidates the differences in low temperature synthesis of ordered pyrochlores when compared to disordered fluorite materials.

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