

IN-SITU XRD TO OPTIMIZE POWDER SYNTHESIS OF AURIVILLIUS PHASES

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Aurivillius phases have shown significant promise as oxygen ion conductors for use in solid oxide fuel cells. The Aurivillius crystal structure allows a wide variety of ionic substitutions in both the perovskite and fluorite-like layers. As a result, it is possible to induce fast oxygen ion conduction by introducing oxygen vacancies into the crystal structure by doping with ions of different valence. Furthermore, it has also been shown that a discontinuity exists in the oxygen ion conductivity at high temperatures. The discontinuous jump to fast ion conduction at high temperature is a result of a jump in the mobility of the oxygen ions by disordering of the oxygen sublattice – often as a result of a true order-disorder transformation.

Synthesis of phase pure samples using traditional methods is difficult; the layered nature of the crystals often leads to stacking inhomogeneities and multiple phases with different stacking sequences. The existence of multiple phases has proven to be the rule rather than the exception. Therefore, high temperature x-ray diffraction (HTXRD) was used to study the reaction sequences for powders produced using solid state reaction and organometallic precursors. The success of the technique for producing $\text{Bi}_2\text{La}_2\text{Ti}_3\text{O}_{12}$ is demonstrated. Additional in-situ XRD measurements show that the Aurivillius phases of interest transform to higher symmetry on heating.