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Solid state chemistry

Our research interest is related to solid state chemistry. Some recent research projects are outlined below:

- (1) Multinary chalcogenides: The major goal of this research is to synthesize new solid state compounds with novel structures and properties. Fig. 1 shows an new quaternary selenide $\text{Sr}_{8.01}\text{Ge}_{2.04}\text{Bi}_{7.95}\text{Se}_{24}$ that has been synthesized and structurally characterized. Multinary chalcogenides are semiconducting materials that may exhibit high figure-of-merit for applications in thermoelectric devices.
- (2) High performance catalyst for oxidative steam reforming of ethanol: One example is the metal-substituted pyrochlore materials $\text{La}_2\text{Ce}_{2-x}\text{Ru}_x\text{O}_7$ ($x=0-0.35$) that is a active OSRE catalyst. The results indicated that the catalytic activity and stability of OSRE was correlated to the amount of the active metal cation (Ru^{n+}).
- (3) Oxide materials for intermediate temperature solid oxide fuel cell: The materials were synthesized by solid state reaction, sol-gel or glycine-nitrate (GNP) processes. The electrolyte support cell can be fabricated by tape casting process. Physical property measurements, including powder X-ray, impedance, electric/ionic conductivities, cell performance etc. were carried out to understand the properties of as-synthesized materials and performance of power out put for a single cell.

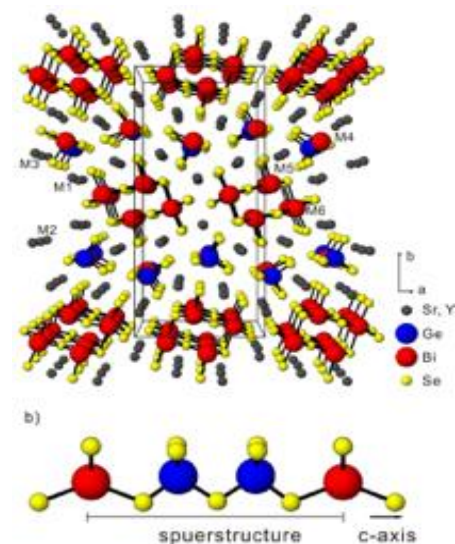


Fig 1. $\text{Sr}_{8.01}\text{Ge}_{2.04}\text{Bi}_{7.95}\text{Se}_{24}$

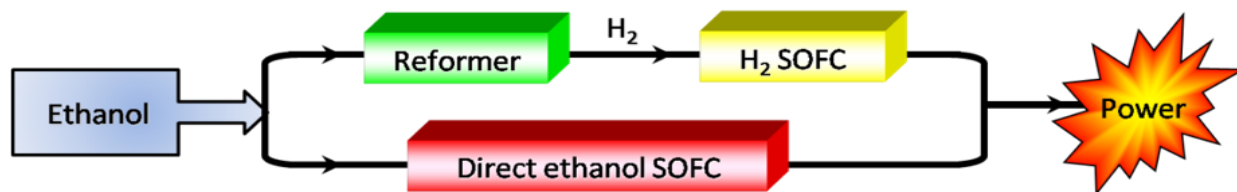


Fig 3. Ethanol transformation process

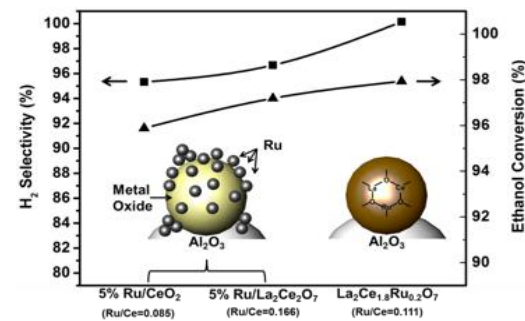


Fig 2. $\text{La}_2(\text{Ce},\text{M})_2\text{O}_{7-\delta}$ ($\text{M} = \text{Ru}, \text{Ni}$)