Abstract

Everyone, whether they live in a rural or urban region, requires energy. Solid oxide fuel cell devices are utilized to effectively supply clean energy. However, the traditional electrolyte, Yttrium Stabilized Zirconia (YSZ), operates at extremely high temperatures of up to 1000 degrees Celsius. The ionic behavior of innovative fuel cell materials must be explored in order to improve the efficiency of such devices. The ionic conductivity of the electrolyte material should be 0.15cm–1 as one important criterion for lowering the operating temperature. Perovskites are a promising choice for modifying the ionic conductivity of SOFCs due to their better electrical characteristics. In this work, we have synthesized a cobalt-free electrolyte based on cerium perovskite and investigate its electrical and structural characteristics in order to make it appropriate for SOFC fuel cells. In this work (x=0, 0.2, 0.4) has been synthesized using facile Sol-Gel method and sintered at 800oC for 5 hours. The structural characterization XRD and Raman confirmed the formation of the Ce doped perovskite material. The XRD results confirmed the formation orthorhombic perovskite of space group P m m a (51). The particle size of the prepared perovskite is increase with increase in doping concentration of Ce. With increase in doping concentration of Ce XRD spectra shifted towards the lower angle due the large ionic radii of Ce. The Raman results show the presence of Raman vibrational modes of LaFeo3, Ceo2, and SrO. FTIR results also reflect the presence IR vibrational modes of the all materials and doped material in perovskite. The band gap of the Ce doped lanthanum-based perovskite material was estimated using Tauc equation. The band gap of the prepared samples varies between 3.49eV to 3.47eV. The Room temperature Electrical conductivity of the perovskite material was recorded to estimate the conductivity of the prepared Ce doped perovskite material.