Dielectric and Optical properties of $\text{RE}_{1.8}\text{Sr}_{0.2}\text{CuO}_{4\pm\delta}$ (RE = La, Pr, Nd)

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The present work investigates the optical and dielectric properties of three Sr-doped rare earth copper oxide $\text{RE}_{1.8}\text{Sr}_{0.2}\text{CuO}_{4\pm\delta}$ (RE=La, Nd, Pr) synthesized by the solid-state reaction at 1000 °C. The title samples were characterized by X-ray powder diffraction which shows that the three samples crystallize in the tetragonal system with close unit cell parameters. The morphology and the practical size of the powder were studied by the means of Scanning Electron Microscopy and the grain size are about 1-5 μm. The optical band gap of the titled compounds have been determined and they are in the 1.19-1.30 eV range. Detailed studies of dielectric properties of the compounds as a function of frequencies at different temperatures (270-500°C) show that $\text{La}_{1.8}\text{Sr}_{0.2}\text{CuO}_{4\pm\delta}$ and $\text{Pr}_{1.8}\text{Sr}_{0.2}\text{CuO}_{4\pm\delta}$ have a very high dielectric constant $\epsilon' > 10^9$ compared to $\text{Nd}_{1.8}\text{Sr}_{0.2}\text{CuO}_{4\pm\delta}$ ($\epsilon' \approx 800$). While $\text{La}_{1.8}\text{Sr}_{0.2}\text{CuO}_{4\pm\delta}$ and $\text{Pr}_{1.8}\text{Sr}_{0.2}\text{CuO}_{4\pm\delta}$ have an important dielectric loss (≈ 65 -70) compared to $\text{Nd}_{1.8}\text{Sr}_{0.2}\text{CuO}_{4\pm\delta}$ which has a very low value (≈ 0.65).

Keywords: Cuprate, Rare Earth, optical bond gap, dielectric properties.

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