INVESTIGATION OF STRUCTURAL, ELECTRICAL AND OPTICAL PROPERTIES OF CALCIUM SUBSTITUTED BARIUM TITANATE THIN FILMS FOR APPLICATION IN HARD TISSUE ENGINEERING

ABSTRACT

Barium titanate ($BaTiO_3$) and calcium (Ca) doped $BaTiO_3$ thin films with 2-8 Ca at.% have been successfully deposited onto glass substrate at 350 ºC using spray pyrolysis technique. All the synthesized films were characterized by X-ray diffraction (XRD), Field emission scanning electron microscopy (FESEM), Energy dispersive X-ray (EDX), Atomic force microscope (AFM), UV–Vis spectroscopy (UV–Vis) and four probes. FESEM images reveal uniform surface with grain size from 1.38 to 4.95 μm and all the components were confirmed by EDX analysis. The XRD confirmed crystallinity of highly oriented hexagonal phase of BaTiO3 films and after doping crystallite size were reduced from 190 nm to 117nm. AFM indicated surface roughness of pure and doped samples. The Ca doped thin films exhibited high transparency with almost 47% maximum transmittance in the visible region. The optical band gap was calculated in the range of 3.90-3.80 eV. Electrical conductivity of the films increased with increasing Ca content. The above results reveal the suitability of Ca doped $BaTiO_3$ thin film as potential candidate for hard tissue engineering.