CHAPTER VI

CONCLUSIONS

In this thesis, we focus on the effect of gamma ray irradiation on optical properties of BTO, Fe-doped BTO and Fe-doped CCTO and electrical properties of CCTO thin films. We prepared the BTO, Fe-doped BTO, CCTO and Fe-doped CCTO thin films by a sol-gel spin coating technique with the annealing temperature of 800 °C. BTO, Fe-doped BTO and Fe-doped CCTO thin films were grown on the quartz substrate for investigating the optical properties, while the CCTO thin film were grown on the Al_2O_3 in order to investigate the electrical properties, respectively. The conclusion of this thesis is as follows:

For BTO and Fe-doped BTO, the WDX shows signals that are consistent with $Ba_{0.8}Fe_{0.2}TiO_3$ with the Fe doping occurring by substitution of Ba sites in BTO. Gamma irradiation effects were found to be more pronounced for the Fe-doped BTO films than for the undoped BTO. The transmittance in the UVvisible range of Fe-doped BTO decreased by 11%, while that of BTO films decreased to 4% after 15 kGy irradiation respectively. The refractive index of the films, as measured in the 350 - 750 nm wavelength range was in the 2.24 - 2.00 range to 2.30 - 2.00 range after gamma irradiation at 15 kGy for Fe-doped BTO. The extinction coefficient of Fe-doped BTO films was in the order of 10^{-2} and increased after gamma irradiation. These changes are due to the formation of colour centers and the concomitant change in the complex refractive index for the irradiated Fe-doped BTO films.

The transmittance of Fe-doped CCTO films was reduced to 2.5%, 4.8% and 5.0% after exposure with gamma irradiation dose of 1 kGy, 3 kGy and 5 kGy, respectively. The refractive index increased from 1.76 - 1.99 range to 1.91 - 2.08 range for Fe-doped CCTO upon the gamma irradiation with a 3 kGy dose, respectively. The extinction coefficient of the Fe-doped CCTO film was in the order of 10^{-2} and increased after gamma irradiation. The capacitance of the CCTO film before gamma ray irradiation which increases from 1.36 - 1.22 pF to 1.62 - 1.36 pF after gamma ray irradiation dose of 5 kGy. The dielectric constant of the CCTO film increase from 314 - 280 to 552 - 308 after gamma ray irradiation dose of 5 kGy and loss tangent of CCTO film increase from 0.020 - 0.013 to 0.138 - 0.030 after gamma ray irradiation dose of 5 kGy, respectively.

Effects of gamma ray irradiation on fundamental properties of perovskite thin films prepared by a sol-gel spin coating techniques can be applied in design of modern radiation dosimeters based on the change in their optical and electrical properties.