

## Structural and optical properties of manganese-doped cobalt thin films prepared by spray pyrolysis

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This paper presents the deposition of manganese-doped cobalt ferrite (CoMnF) thin films on FTO substrates using spray pyrolysis. Optimization of the crucial growth parameters, along with annealing at 450°C for 2 hours, has led to a single-phase cubic spinel structure without any extraneous peaks confirmed by X-ray diffraction. The films have interplanar distances between 4.896 to 1.484 Å, crystallite sizes are small: FWHM: 0.338° to 0.497°, and the lattice constant is 8.418 Å. FTIR has identified a peak at 431 cm<sup>-1</sup>, with implications for the presence of the ferrite phase due to the existence of octahedral metal-oxygen stretching. The UV-Vis spectra reveal strong absorption at 215 nm and 347 nm. The direct bandgap has been found to be 5.6 eV. Raman vibrational modes are affected due to Mn doping. These Mn-doped Co-ferrite thin films have properties that are well suited for application in supercapacitors, sensors, and energy storage devices.

**Keywords:** Thin film, Spray pyrolysis, Cobalt ferrite, Structural properties