

## **Preparation, dielectric and optical properties of Cr<sub>2</sub>O<sub>3</sub> /PVC Nanocomposite films**

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**Abstract:** Chromium oxide (Cr<sub>2</sub>O<sub>3</sub>) nanoparticles were synthesized using a sol-gel method and mixed with polyvinyl chloride (PVC). Rietveld refinement of X-ray powder diffraction (XRD) patterns of the samples revealed that the crystal structure of Cr<sub>2</sub>O<sub>3</sub> is rhombohedral with space symmetry group . Scanning electron microscopy images showed that the Cr<sub>2</sub>O<sub>3</sub> nanoparticles are well dispersed on the surface of the PVC films. The dielectric permittivity ( $\epsilon'$ ), and ac conductivity ( $\sigma_{ac}$ ) of pure PVC increased with adding Cr<sub>2</sub>O<sub>3</sub> due to the formation of conductive three-dimensional networks throughout the nanocomposite films and interfacial polarizations. The optical energy band gap ( $E_g$ ) of the films decreases with increasing Cr<sub>2</sub>O<sub>3</sub> content. The refractive index dispersion of the nanocomposite films obeys the single oscillator model. The dispersion parameters are changed by incorporation of Cr<sub>2</sub>O<sub>3</sub>. The optical properties of PVC are influenced by addition of Cr<sub>2</sub>O<sub>3</sub> nanoparticles.

Keywords : Cr<sub>2</sub>O<sub>3</sub> nanoparticles; polymer nanocomposites; dielectric properties; refractive index; optical dispersion.