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# Functionalized SiC nanocrystals for tuning of optical, thermal, mechanical and electrical properties of polyvinyl alcohol

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**Abstract:** Polyvinyl alcohol (PVA)-SiC nanocomposite films were prepared by incorporating functionalized Silicon Carbide (f-SiC) nanocrystals in PVA matrix. Structural characterization of SiC nanocrystals before and after the functionalization was carried out using Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD) and Thermogravimetric analysis (TGA). Transmission electron microscopy (TEM) and Scanning Electron Microscopy (SEM) were used to study the morphology and size distribution of f-SiC nanocrystals in PVA-SiC nanocomposite films. TEM and SEM images depict an improved dispersion of f-SiC nanocrystals in PVA matrix. UV-Visible absorption spectroscopy was employed to study the optical properties such as absorption coefficient (α), optical energy gap ($E_g$), Urbach's energy ($E_u$), refractive index (n) and dielectric constant of PVA and PVA-SiC nanocomposite films. Refractive index of PVA, at 550 nm wavelength, increased from 1.7 to 2.2 for PVA-SiC nanocomposite film containing 0.023 wt% f-SiC nanocrystals. TGA shows that the onset of thermal decomposition of PVA is only slightly affected by the addition of f-SiC nanocrystals. Knoop microhardness number has increased from 23MPa for PVA to 45MPa for PVA-SiC nanocomposite film containing 0.023 wt% f-SiC nanocrystals at an applied load of 9.8 mN indicating improved interfacial interaction. Current-voltage analysis indicated an increase in conductivity of PVA with the introduction of f-SiC nanocrystals. The conduction mechanism responsible for charge transport in PVA-SiC