

Enhanced Dielectric Response in $\text{Na}_{1/3}\text{Bi}_{1/3}\text{Ca}_{1/3}\text{Cu}_3\text{Ti}_4\text{O}_{12}$ /PVDF Composites by Filling with Ni Nanoparticles

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In this work, Ni nanoparticle/PVDF-($f=0.2$) $\text{Na}_{1/3}\text{Bi}_{1/3}\text{Ca}_{1/3}\text{Cu}_3\text{Ti}_4\text{O}_{12}$ (Ni/PVDF-NBCCTO) three-phase polymeric nanocomposites with different Ni were fabricated by a liquid-phase assisted dispersion and hot pressing at 200 °C for 0.5 h. The microstructure of the fabricated polymeric nanocomposites were characterized by a scanning electron microscope. The dielectric properties were investigated as a function of frequency (10^2 - 10^7 Hz) at room temperature. It was found that the dielectric permittivity (ϵ') of the Ni/PVDF-NBCCTO nanocomposites increased with increasing Ni filling concentration; whereas, the dielectric loss tangent ($\tan \delta$) was also enhanced. The ϵ' values of the Ni/PVDF-NBCCTO nanocomposites with Ni volume fractions of 0.05, 0.10, 0.15, 0.20, 0.225, 0.25, and 0.275 were found to be 34.8, 40.5, 72.6, 119.6, 233.9, 210.7, and 1120.6, respectively. The enhanced dielectric response in the nanocomposites can be well described by the interfacial polarization and the formation of micro-capacitor in the microstructure.

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