

High-temperature Mechanical Behaviour and Phase Morphology of
Poly(Tetrafluoroethylene)/Siloxane Nanocomposites Used as Ultra Low-k
Dielectrics

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Abstract

Poly(tetrafluoroethylene) (PTFE)/siloxane nanocomposites have been prepared as ultra low-k dielectrics. These new nanocomposites show excellent high-temperature mechanical properties compared to unfilled PTFE while their dielectric constant almost remains unchanged. Specifically, the data from the dynamic mechanical study indicates that these nanocomposites have the mechanical behaviour similar to that of crosslinked polymers. Small-angle neutron scattering (SANS) has been carried out to characterize the phase morphology of the PTFE/siloxane nanocomposites and the size of the inorganic networks. It has been shown that no phase separations or orientations appear in these nanocomposites in the range of 12 to 469 nm. These SANS results suggest that these materials are single-phase nanocomposites that are very homogeneous and isotropic. They are basically PTFE-based molecular composites.