Structural, Thermal and Viscoelastic Properties of Nanodiamond-Reinforced Poly (vinyl alcohol) Nanocomposites

Corresponding author:

Tomáš Remiš, tremis@ntc.zcu.cz, Nové technologie - výzkumné centrum

Co-authors:

Petr Bělský, Tomáš Kovářík, Jaroslav Kadlec

Abstract:

Advanced polymer nanocomposites comprising polyvinyl alcohol (PVA) and nanodiamonds (NDs) were developed using a single-step solution-casting method. The properties of the prepared PVA/NDs nanocomposites were investigated using Raman spectroscopy, small- and wide-angle X-ray scattering (SAXS/WAXS), scanning electron microscopy (SEM), transmission electron microscopy (TEM), thermogravimetric analysis (TGA), differential scanning calorimetry (DSC) and dynamic mechanical analysis (DMA). It was revealed that the tensile strength improved dramatically with increasing ND content in the PVA matrix, suggesting a strong interaction between the NDs and the PVA. SEM, TEM and SAXS showed that NDs were present in the form of agglomerates with an average size of ~60 nm with primary particles of diameter ~5 nm. These results show that NDs can act as a good nanofiller for PVA in terms of improving its stability and mechanical properties.

Key words:

Poly (vinyl alcohol); Nanodiamond; Nanocomposite; Mechanical properties; Morphology