Ultragarso sklidimo tyrimas PDMS/ZnO kompozituose

Ultrasonic wave propagation in PDMS with ZnO nanoparticles

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The integration of nanoparticles within a polymer is widely used to create nanocomposites with enhanced material properties. Polymer based nanocomposites have attracted increasing attention because of their unique properties emerging from the combination of organic and inorganic materials [1]. Our nanocomposite includes polydimethylsiloxane (PDMS) which distinquishes from other organic silicones for its lowest glass-transition temperature (148 K) and good thermal stability, ZnO - a semiconductor with a relatively high longitudinal acoustic wave velocity (6027 m/s).

Investigation of mechanical relaxation over a wide range of temperature in PDMS-ZnO nanocomposites with different concentrations of ZnO nanoparticles (30 nm) (0, 1, 2, 5, 10 %) was performed in order to determine the interaction between the ZnO nanoparticles and PDMS polymer.

Figure 1 shows dependency of acoustic wave attenuation on the concentration of ZnO in the nanocomposite at room temperature. It can be observed from the figure that the height of the loss increases with addition of ZnO. We attribute this dependency to the additional elastic energy dissipation due to wave scattering from the dispersed ZnO particles similarly as it was observed in styrene-butadiene rubber with rigid polystyrene particles [2].

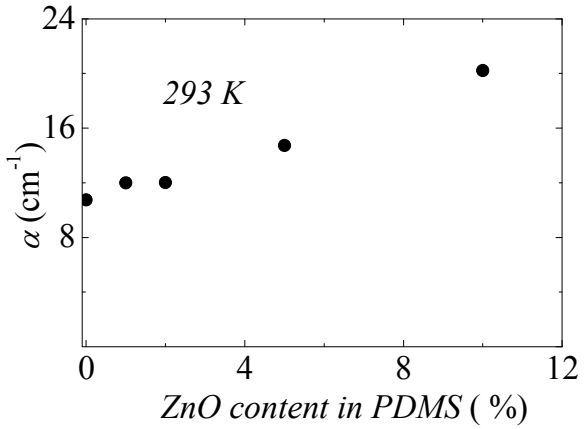

Fig.1. Experimental dependency of ultrasonic attenuation on ZnO content in PDMS nanocomposites

Keywords: PDMS, ZnO, ultrasonic, composites

References

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