Nanocomposites and nanomaterials

Optical Properties of Polytetrafluoroethylene–Carbon Nanotubes Composite in the Light Spectrum Range 320–1000 nm

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The influence of carbon nanotubes concentration (in wt.%) on optical properties of polytetrafluoroethylene was investigated by the spectrophotometric analysis. The effect of transparency increasing at 4–25 times was detected in the spectrum range $\lambda = 320–1000$ nm during the addition of carbon nanotubes to polytetrafluoroethylene. It was shown that increasing of carbon nanotubes concentration and the thickness of the sample leads to decreasing of composite's transparency in ultraviolet band, and also to increasing of transparency in infrared band.

For polytetrafluoroethylene films were obtained the dependences of monochromatic light transmission factor ($K_{tr.}$) on the thickness in the wide range from 25 to 500 μm. For the thinnest (15 and 20 μm) samples the most light transmission (80%) at $\lambda = 1000$ nm is observed. It was shown that with reducing of wavelength down to $\lambda = 320$ nm the light transmission factor monotonically decreases to the values 38–45%. For the samples with maximum thickness (500 μm) the light transmission factor decreases to 1–2%. It should be noted that for minimal values of thickness (<25 μm) the $K_{tr.} = f(\lambda)$ curves are convex, but for larger thicknesses (>35 μm), on the contrary, the curves have a concave form. The thickness of the sample at which the inversion occurs is approximately 30 μm. Thus, at low concentrations of carbon nanotubes in polytetrafluoroethylene the light transmission increases in the infrared band for a wide range of thicknesses, contrary to the Beer–Lambert–Bouguer law. In the ultraviolet band the effect were observed in very small values of thickness (30–60 μm).