

Z-scan study of nonlinear properties of carbon nanostructures

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A study of nonlinear properties of suspensions of Astralen nanoparticles in water, as well as fullerene C₆₀ aggregates in toluene-hexane mixtures were carried out. Astralen is a carbon nanostructure in form of polygonal closed fulleroid multishells whose physical properties are described in [1, 2]. Along with carbon black and carbon nanotubes it possess a strong optical limiting effect caused by nonlinear light-induced scattering [3, 4]. Fullerene C₆₀ suspensions also shows a high-threshold optical power limiting mainly related to the reverse saturable absorption. The last phenomenon is determined by electronic structure of a nanoparticle that changes with fullerene aggregation, and is expected to be different in changing the solvent.

In this paper we report results of precise measurements of linear and nonlinear absorption coefficients of fullerene C₆₀ suspensions with different degrees of aggregation and a determination method of nonlinear scattering cross section of Astralen suspension using closed aperture Z-scan measurements with different aperture size.

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