Linear and nonlinear optical properties of the CdSe nanocrystals embedded in PMMA matrix

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Résumé en anglais	CdSe nanocrystals (NCs) were prepared using a colloidal solution and dispersed in polymethylmethacrylate (PMMA) matrix. Using spin coating technique, thin films deposited on glass substrates were prepared. Their structural and optical properties were investigated by X-ray diffraction, atomic force microscopy (AFM) and UV-visible absorption, respectively. The absorption spectra of these dispersed NCs exhibit excitonic peaks resulting from the electron-hole coupling transitions. Due to a quantum confinement effect, a blue shift is deduced by comparison of such transition with respect to reported bulk band gap. Assuming a spherical like shape for these NCs, the crystallites radius (R) was estimated by applying the effective mass approximation model and was about 2.92 nm. Such a weak radius value compared to Bohr radius (RB = 5.5 nm) leads to a strong quantum confinement regime. Moreover, the influence of this confinement effect on nonlinear optical (NLO) properties was also studied. Quadratic and cubic NLO properties were investigated by second and third harmonic generation techniques (SHG and THG) with a Q-switched Nd:YAG laser working at 1064 nm fundamental wavelength. The NLO susceptibilities X<2>eff, X<3>eff were measured to be equal to 2.27.10-10(m/V) and 2.28.10-20(m2/V2), respectively.
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