Incorporation of CdSe nanoparticles from colloidal solution into optically clear ureasilicate with preservation of optical properties.

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The synthesis of semiconductor nanoparticles (NPs) in colloidal solutions is under intense investigation due to their unique optical properties for photonic applications [1]. The integration of semiconductor NPs in a solid matrix boosted the investigation of potential photonic and electronic applications. Semiconductor NPs have also high potentialities of application in photovoltaic cells and electroluminescence panels [2].

The synthesis of stable colloidal solutions with monodispersed size and shape is a key step in the production of functionalized materials with designed optical and chemical properties [3]. The other step is the sol-gel procedure, which is fundamental in obtaining transparent and mechanically stable materials containing NPs with the individual optical properties preserved [4].

Hybrid organic-inorganic based materials with embedded CdSe nanoparticles were prepared by mixing the pre-formed colloidal solutions with the ureasilicate matrix precursors. Cdse nanoparticles colloidal solution with uniform size and shape were prepared by a reverse micelle technique. A cadmium salt and Na₂SeSO₃ were used as the CdSe source. The ureasilicate matrix was obtained by the reaction of a diamine substituted polyether with a substituted triethoxysilane. In order to obtain the nanocomposite with the best properties, several catalyst and stabilizers were used in order to preserve the quantum properties of the CdSe nanoparticles in the ureasilicate matrix.

The obtained composites were characterized by absorption (UV/Vis) and photoluminescence spectroscopy. These composites are high transparent, high flexible and exhibit a long term stability. The implanted nanoparticles make these composites useful for applications in practical optical devices, due to their unique optical features.

References