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The photoluminescent properties of CdS clusters of different size in porous glasses

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Abstract

CdS nanoclusters were formed in the porous glass matrix by sequential chemical deposition from liquid-vapor phase and their chemical content was investigated. The room temperature photoluminescence spectra of specimens excited with a 235 nm wavelength had typical narrow peaks at 400 nm. The peaks can be explained by quantum effects for charge carriers confined inside the small-size (radius of the order of several nanometers) clusters. At the same time the luminescence spectra of the same specimens, but excited with a xenon lamp at 77 K, had peaks at ~700 nm that approximately corresponded to the band gap of the crystalline CdS. The possibility of the crystallites existence follows from the size distribution of voids in the porous glass matrix and is confirmed by the X-ray spectra typical of the wurtzite structure. The peculiarities of the observed luminescence spectra are explained by the energetic diagram of CdS in the configurational space.



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