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Change in Stokes Shift of Embedded Quantum Dots in Response to Pressure TYSON OLHEISER, THOMAS CARLSON, JONATHAN TROVILLION, GHASSAN AL-CHAAR, ROBERT LOZAR-MCDONALD, CHARLES MARSH, Construction Engineering Research Laboratory, MUNIR NAYFEH, University of Illinois at Urbana-Champaign — Although the fluorescence of nanoparticles (NP) has been known for years, there has been renewed interest in their possible applications. One innovative idea is to exploit the Stokes shift in such a way that the absorbed UV and emitted visible light can be used as a probe and output data source, respectively. The focus of our research has been to characterize the pressure dependence of the emission wavelength of NPs embedded in a transparent, amorphous material. A wavelength shift associated with embedding the NPs (Effect 1) has been experimentally measured by our group as well as a further shift due to an external pressure (Effect2). These results are explained by a theoretical model that considers a quantum confinement picture coupled with a deformation potential contribution. In addition, the analysis addresses surface energy terms as well as effects caused by a NP-encapsulating shell. In short, the theory predicts the emission wavelength for a given external pressure exerted on a continuum containing NPs.

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