Entanglement of quantum dot excitons coupled through a linear chain of micro-spheres

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Integration of quantum dots (QDs) in photonic crystal (PhC) is promising for various applications in optoelectronics and quantum information processing. It is now possible to control both position and spectrum of QD in such a way that a highly efficient coupling between QD and PhC is realized. Very recently, we developed a fully quantum mechanical description of the coupling from a viewpoint of spontaneous emission in a general structured reservoir of quantized radiation modes. By applying it to a QD embedded in a bi-spheres micro-cavity, we found that the spontaneous emission spectrum at a local observation point is strongly affected by the Green function of photon [1]. A similar description is also possible for the entanglement of QD excitons coupled though a structural reservoir [2]. We can analyze the degree of the entanglement, the emission spectrum, etc of the correlated excitons by using the photon Green function. In this presentation some theoretical results of the correlated QD excitons will be given for a linear chain of micro-spheres as a reservoir. In particular, we will discuss their relevance to the one-dimensional photonic bands of the chain.

[1] T. Ochiai, J. Inoue, and K. Sakoda, *Phys. Rev.* A in press.
[2] T. Ochiai, J. Inoue, and K. Sakoda, in preparation.