Title: **Study of Quantum Theory and its Effect on Band Gap in Semi-conductors**

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In the semiconductor industry, researchers are continuously exploring ways to improve the economic costs and the speed of semiconductor devices. As a consequence of their investigations, it is now possible to create tiny crystals which contain less than a thousand atoms. The peculiar feature of these crystals is that although they all have precisely the same composition, they exhibit quite different properties. In particular, the larger crystals are found to be red in color, smaller ones orange, and the very tiniest are blue-green. These tiny specks of matter are called Quantum Dots.

In general, the wavelength, or color, of the light emitted by the quantum dots depend upon the amount of energy the conduction electron must give in order to recombine with a hole. This is determined by the magnitude of the band gap of the semiconductor. Consequently, the use of different types of semi-conducting materials results in various colors of light. Semi-conducting alloys such as Ge/Si, InAs/GaAs, (In,Ga)As/GaAs, (Ga,In)P/InP, CdSe/Zn(S,Se), and (In,Ga)N/GaN have spectral region ranging from the near infrared (~ 1.5μm) to the blue-green region (~ 430-500nm).

In quantum dots, excitons (bound electron-hole pairs) are confined in all three spatial dimensions and as a result, they have properties that are between those of bulk semiconductors and those of discrete molecules with features that include a tunable absorption pattern, and a tunable emission pattern. Quantum dots are practically useful for optical applications due to their theoretically high quantum yield.

In an effort to exploit the tremendous potential of Quantum Dots for device application, researchers of solar technology applied the Quantum Dot to devise the Quantum Dot Solar Concentrator (QDSC), a novel, non-tracking solar concentrator, which uses nano-scale Quantum Dot technology to render the concept of the fluorescent dye solar concentrator (FSC) a practical proposition.

Review of experimental data collected on the QDSC indicated poor performance in its application as a novel solar concentrator when compared to the FSC. Clearly more theoretical research must be done on what are the factors that affect the performance of the Quantum Dot.