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Tailoring the Optical Gap and Absorption Strength of Silicon Quantum Dots

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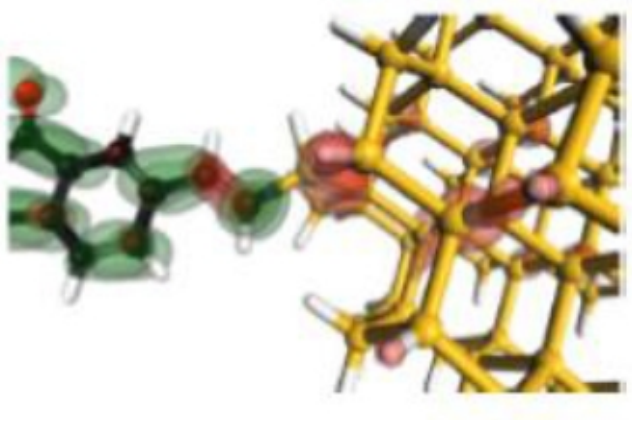
Summary: Silicon-based quantum dots (SiQDs) with an organic surface functional that have improved electronic and optical properties

Description: Colloidal semiconductor quantum dots (QDs) have useful properties that include tunable adsorption and emission spectra, solution processability, multiple exciton generation, and slow cooling rate of hot carriers. Most QDs that are currently explored are based on metal chalcogenide semiconductors that use toxic elements such as cadmium and/or lead, which is problematic for many poor carrier applications. A non-toxic alternative is silicon-based quantum dots (SiQDs); however, their use is hampered by several challenges. For example, dangling bond defects negatively impact their optical performance, agglomeration of the dots in solution, poor carrier mobility of assemblies of dots, and low band edge absorption of bulk silicon. This invention relates to SiQDs that are modified with an organic surface functionalization. Conjugated vinyl connectivity between the SiQD and the organic surface ligand result in orbital redistributions that can have a dramatic impact on the optical and electronic properties. The material's genome for new class of hybrid SiQDs functionalized with conjugated organic surface and bridging ligands has been characterized.

Main Advantages of this Invention:

- Non-toxic
- Improved optical and electronic performance



Potential Areas of Application:

- Photovoltaics
- Solar Energy
- Biomedical Imaging

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Intellectual Property Status: US utility application pending (#14/639,868).

Opportunity: Seeking an exclusive or non-exclusive licensee for marketing, manufacturing, and sale of this technology.

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