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TECH-NEWS

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Presents Technological Update On

Quantum Dots and their Multimodal Applications

By

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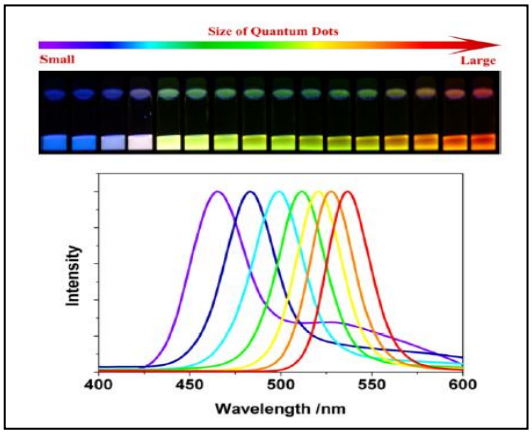
Introduction:

Fluorescent semiconductor nanocrystals are called quantum dots (QDs). Quantum dots are semiconductor nanocrystals whose excitons or charge carriers are spatially confined in all three dimensions reducing the size of materials to a dot in nanometer regime. In quantum dots, the electrons are confined to a point in space. They have no freedom in any dimension and electrons are said to be localized at a point. It is implied that a change in all directions changes the properties. A dot is a three dimensional object comprising several hundreds and thousands of atoms with finite shape. Quantum dots are considered as dimensionless or zero dimensional material. They have been nicknamed "Artificial atoms". Because of their quantum nature, they are called Quantum dots (Q-dots) or Nanodots.

Keywords: Quantum dots; semiconducting nanomaterials; electroluminescence; photoluminescence; solar cells; biological imaging



Quantum Dots with tunable emission colors over the whole visible spectrum (i.e. from blue to red color) as a function of size. This fig. shows the changes on optical behavior of Quantum dots associated with their size ('blue shift' due to quantum confinement)

Applications of Quantum Dots:

Quantum dots can be used for a wide variety of applications. These applications include: next-generation computer chips, better insulation materials, phosphors for high-definition TV, low-cost flat-panel displays, elimination of pollutants, high energy density batteries, high-power magnets, high-sensitivity sensors, automobiles with greater fuel efficiency, aerospace components with enhanced performance characteristics, better and future weapons platforms, longer-lasting satellites, large electrochromic display devices etc.