**Carbon Quantum Dots Synthesis and Its Smart Applications**

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**Abstract:**

Carbon Quantum Dots (CQDs) as a class of Zero-dimensional (0D) carbon-based nanomaterials shows unique optical, physiochemical, electronic properties. It has already shown enormous progress in a variety of areas including drug delivery, optoelectronics, photovoltaics, and photocatalysis. CQDs are promising imaging materials due to their aquas dispersity, photoluminescence from ultra-violate to near-infrared region of radiation and its photostability. The reasons behind these intriguing properties are control over particle size and surface passivation. The covalent linkage and chemical adsorption make the CQDs able for surface passivation process which are their physicochemical property. Being less toxic and biocompatibility CQDs are preferred over other QDs and also for many applications from photonic device manufacturing to bio-imaging and solar cell. Photo-detector (solar cell, smart devices), which is dependent on the photon-induced formation of electron-hole pairs at the junction of a p-n diode, converts light into electrical impulses. The band gap and electrical density of CQDs can be modified chemically by doping them with heteroatoms like N, S, and P. Due to their exceptional qualities such as photostability, ease of surface modification, optical tunability, and environmental friendliness, nanostructures are also being used to create heavy metal detecting devices either as-produced or by modification. The ability of CQDs to couple the necessary selective receptors on their surface has attracted the attention of scientists because they can easily have their surfaces modified utilising a broad range of naturally occurring functional groups such carboxyl, epoxy, and hydroxyl. The high surface area and rapid electron transfer of CQDs are suitable in electrochemical applications. Additionally, functional groups on zero-dimension (0D) carbon nanomaterials that are rich in heteroatoms as mention earlier provide ideal active sites for improved electrochemical characteristics.

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