controlled colloid precipitation method is a common approach used for synthesizing CdS nanoparticles. However, the quantum yields of these nanoparticles were relatively low due to insufficient crystallization of their surfaces, resulting in poor luminescence of the final hybrid material. In earlier studies, researchers have explored the use of high-temperature and organic capping agents in the synthesis of CdS quantum dots. High-temperature synthesis methods can promote the formation of high-quality CdS quantum dots by minimizing the formation of defects and surface traps during the early stages of the preparation. While organic capping agents can reduce the formation of surface defects and passivate the surface of CdS quantum dots, which can improve their photoluminescence properties. [10.1039/b412317d]

Cadmium sulfide (CDS) QDs, which have a direct band gap of 2.4 eV and are frequently used in solar cells, light-emitting diodes for flat panel displays, and particularly in photo chrome-fluorophore assemblies as fluorophores. They have recently been recognized as an emerging class of broad-band radiating nanoparticles. [5]

Although because of their potential for industrial use, biosynthesized CdS QDs are among the most well-researched and thoroughly characterized metal sulfide NPs. The production of CdS NPs by certain bacteria in the presence of Cd^{2+} and sulfate anions has been demonstrated. Typically, biomolecules are added to these CdS NPs to give the finished products enhanced stability, water solubility, and/or unique biocompatibility properties. To produce semiconductor nanocrystals with new properties, extremophiles have specifically been suggested as an option. Stable CdS QDs have been produced at high salt concentrations and low pH levels, respectively, by utilizing only extremophile-halophilic and acidophilic bacteria [6].

Atoms from elements in groups II to VI, III to V, or IV to VI of the periodic table are used to create quantum dots. Recently, a few decades ago, due to their unique characteristics, QDs garnered considerable attention. Cadmium Sulfide (CdS) Quantum Dots (QDs) are indeed widely researched QDs, these QDs are made up of group II-VI semiconductor materials with Cadmium (Cd) as the group II element and Sulfur (S) as the group VI element. Here, some information is available on the preparation, properties, and applications of Cadmium Sulfide Quantum Dots (CdS QDs). Numerous research studies have been conducted on these QDs, and the information can be acquired from several sources. The unique properties of CdS QDs make them promising materials for the expansion of numerous technologies, including optoelectronics, medicine, optics, and sensor technology. Fluorescence sensors for metal ion-sensing applications frequently use Cds QDs (Cadmium Sulfide Quantum Dots).

For organometallic-type synthetic approaches of QDs that provide a hydrophobic surface to CdS, CdSe, or CdTe QDs, trioctylphosphine and trioctylphosphine oxides (TOP/TOPO) have been employed as the conventional 43 capping agents.