

Formation of oxide-free PbS quantum dots by spin assisted successive ionic layer adsorption and reaction

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PbS quantum dots (QDs) have been of great interest because of their noticeable properties such as high absorption coefficient by direct bandgap, convenient bandgap tailoring by size control and multiple exciton generation. Therefore, the PbS QDs are good model candidate as a new sensitizer to demonstrate highly efficient QDs-sensitized solar cells. Until now, the uniform PbS QDs have been successively synthesized by the hot-injection colloidal solution chemistry. However, the long alkyl chains to form uniform size should be removed or substituted to much short chains to efficiently transport charge carriers between multiply layered PbS CQDs. Hence, it is more desirable to form PbS QDs without insulating passivation layer by simple bottom-up solution chemistry such as SILAR (successive ionic layer adsorption and reaction). The conventional SILAR method requires many repeated steps of dipping in cationic solution, drying, washing, dipping in anionic solution, drying, and washing and commonly leads the formation of PbS QDs with oxide impurities. Here, we used spin-assisted SILAR to reduce the separated drying and washing steps in conventional SILAR method and formed the pure PbS QDs by controlling the kind of Pb precursor.