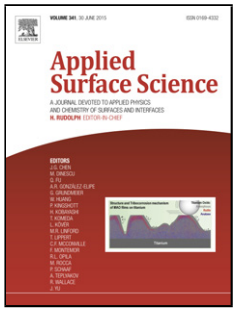

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PII: S0169-4332(17)32061-5
DOI: http://dx.doi.org/doi:10.1016/j.apsusc.2017.07.071
Reference: APSUSC 36605

To appear in: *APSUSC*

Received date: 28-2-2017
Revised date: 5-7-2017
Accepted date: 9-7-2017

Please cite this article as: Navendu Goswami, P.Sen, Water-driven Stabilization of Cadmium Sulphide Nanoparticles, Applied Surface Sciencehttp://dx.doi.org/10.1016/j.apsusc.2017.07.071

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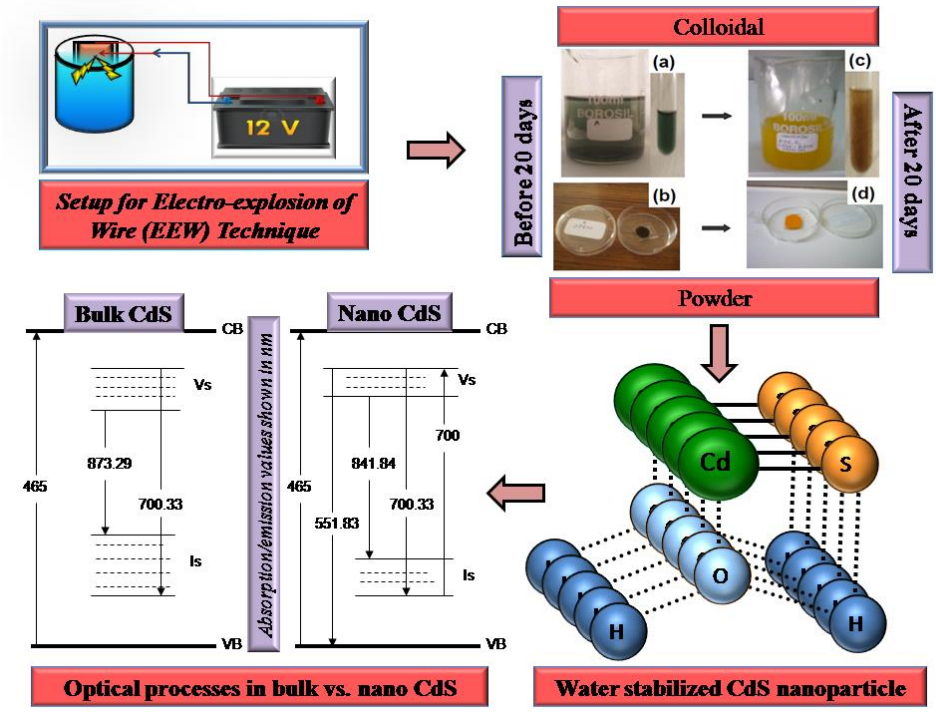
Graphical abstract



Highlights

- Demonstration of water driven stabilization of CdS nanoparticles prepared by EEW based novel synthesis approach
- Variation in stoichiometry of CdS nanoparticles at respective stages of transformation, assist in explaining the structural transformation.
- Alterations in the oxidation state and energies of the nanoparticle constituents, as determined through line shape analysis of XPS spectra, unravel intricacies of structural transformation.
- XPS analysis, in concomitant with XRD interpretations, vividly decipher the stabilization of CdS nanoparticles in aqueous environment.
- Optical processes correlated with structural transformation were illustrated through schematic.