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Ligand control of solubility and capping structure of colloidal CdSe nanorods WEI WANG, SARBAJIT BANERJEE, SHENGGUO JIA, MICHAEL STEIGERWALD, IRVING HERMAN, Materials Research Science and Engineering Center at Columbia University — The length and functional group of the organic capping ligands of colloidal CdSe nanorods play a critical role in determining their solubility in chloroform. Optical transmission spectroscopy shows decreased solubility of CdSe nanorods capped by relatively long ligands, and increased solubility of CdSe nanorods capped by alkyl phosphonate ligands. ^{1}H and ^{31}P nuclear magnetic resonance (NMR) and inductively coupled plasma-atomic emission spectroscopy (ICP-AES) studies indicate that when mixtures of phosphonic acids with different lengths are used in synthesis, the shorter ligands selectively remain on the inorganic surface, but the overall number of ligands on the surface is smaller than that of the nanorods capped by long ligands. The proposed capping structure of colloidal CdSe nanorods is that there is a shell of ligands bound to the core of the nanorods and additional ligands can be trapped by this shell. The bound and the trapped ligands can strongly affect the solubility of the individual nanorods and the interactions between the nanorods that lead to aggregation. This work is supported by the MRSEC program of the National Science Foundation under Award No. DMR-0213574 and by the New York State Office of Science, Technology, and Academic Research (NYSTAR).

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