Fabrication of Zinc Tin Oxide Nanoparticles Using Spherically Self-Assembled Biomimetic Bolaamphiphile Molecules as Templates

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We demonstrate that zinc tin oxide (ZTO) nanocrystals were synthesized inside the cavities of self-assembled biomimetic molecules at room temperature. A biomimetic bolaamphiphile molecule, bis(N-α-amido-glycylglycine)-1,7-heptane dicarboxylate, was mixed with zinc and tin precursors and the biomimetic molecules self-assembled to form a template in which the ZTO nucleates and grows to form ZTO nanoparticles. The experiment was carried out at various pH values to determine whether the pH difference affects the formation of ZTO nanocrystals. AFM images were taken for the size and distribution of nanoreactors. ZTO nanocrystals in the nanoreactors were observed with TEM. Furthermore, HR-TEM and SAED were performed for detailed crystal structures. To determine the elements of nanocrystals, EDX was performed. The outcome of this work may be used for the preparation of semiconductor in mild condition. This novel method can be used wide engineering applications including photovoltaic electrodes for the solar cell.