Direct Access to Multi-Scale Structured Nb_2O_5 Possessing Functional Macrodomain and Mesoporous Frameworks

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Multiple length-scale materials could combine advantages of macro- and nanostructures, but they need the complicated steps. Here, we report direct access to macro- and mesostructured Nb_2O_5 that have functional submicron particles embedded in mesoporous structures. We induced interplay of macro- and microphase separation by self-polymerization of resol. Resol can form a resol-Nb complex by chelating, and also macrophase separate by acid-induced polymerization into macro domain. Niobia sol and resol incorporate into the block copolymer by hydrogen bonding to form mesoporous frameworks. The resultant materials have light-scattering ability due to submicron particles and high surface area due to mesostructures. They increased the power conversion efficiency when used as working electrodes in DSSC