Functional macrodomain-embedded mesoporous Nb_2O_5 for DSSC

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Multilength-scale materials with mesopores has attracted increasing interest due to the combined properties of different lengh scale and the promising applications in catalysis, drug delivery, and energy storage. Here, we report a facile one-pot synthesis of functional macrodomain-embedded mesoporous Nb_2O_5 (FM-Nb_2O_5), which composed of the well-dispersed submicron particles in the mesoporous frameworks. Microphase separation of block copolymer led to organize mesoporous frameworks by co-assembly with Nb precursor. Meanwhile, the employment of resol induced macrophase separation by self-polymerization under the highly acidic atmosphere. The chelating ability of resol enable to form resol-Nb complex, resulting in formation Nb2O5/carbon composite macrodomain. The resultant FM-Nb2O5 possesses a high surface area of 105 m^2 g^{-1}, a lagre pore size of ~31 nm, and the submicron particles of 200-500 nm. FM-Nb_2O_5 improved in efficiency of dye sensitized solar cells compared with mesoporous Nb_2O_5 because the submicron particles enhanced the light-harvesting capability by light scattering.