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Self-assembled peptide nanofiber templated ALD growth of TiO₂ and ZnO semiconductor nanonetworks

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Abstract

© 2016 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim Here peptide amphiphile (PA) nanofiber network is exploited as a three-dimensional soft template to construct anatase TiO₂ and wurtzite ZnO nanonetworks. Atomic layer deposition (ALD) technique is used to coat the organic nanonetwork template with TiO₂ and ZnO. ALD method enables uniform and conformal coatings with precisely controlled TiO₂ and ZnO thickness. The resulting semiconducting metal oxide nanonetworks are utilized as anodic materials in dye-sensitized solar cells. Effect of metal oxide layer thickness on device performance is studied. The devices based on thin TiO₂ coatings (<10 nm) demonstrate considerable dependence on material thickness, whereas thicker (>17 nm) ZnO-based devices do not show an explicit correlation.

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Keywords

atomic layer deposition, metal oxide semiconductors, nanofibers, nanomaterials, peptides, self-assembly