

Synthesis of radially aligned nano-rutile modified with Au and Ni for the photodegradation of methyl orange

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Abstract:

Radially aligned nano-rutile (RANR) was synthesized using the hydrothermal technique. The RANR structure was formed by the radial aggregation of nanorods with an average width of 9 nm. The radii of RANR ranged between 1.2–1.6 μm . Au and Ni (0.5–10 wt.%) nanoparticles were deposited on the tips of RANR by the deposition-precipitation method using urea. The UV–vis DRS spectrum of RANR had a band edge at 3.2 eV, whereas those of Ni-RANR and Au-RANR were characterized by reflectance peaks that extended into the visible part of the spectrum, with Au-RANR having an SPR peak at 2.25 eV. Photoluminescence studies showed that loading RANR with Ni and Au reduced the recombination rate of the charge carriers. The photodegradation efficiency of the various materials was tested on methyl orange using solar simulator radiation source. RANR was the least efficient material, followed by Ni-RANR composites, with Au-RANR composites having the highest activity.