Synthesis, Characterization, and Photocatalytic Properties of ZnO/(La,Sr)CoO_3 Composite Nanorod Arrays

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Abstract
ZnO/(La, Sr) CoO_3 (ZnO/LSCO) core-shell composite nanorod arrays have been successfully synthesized by a sequential combination process of a hydrothermal synthesis followed by a pulsed laser deposition (PLD) process (or a colloidal deposition process). Compared to the colloidal deposition process, PLD has given rise to a more uniform and efficient deposition of continuous LSCO thin film onto ZnO nanorod arrays. During the PLD process, the deposited film uniformity was found to be dependent on the nanorod diameter, array density, and thus specific surface area of the nanorod arrays, in addition to the PLD deposition parameters. Field-emission scanning electron microscopy (FESEM), transmission electron microscopy (TEM), and X-Ray Diffraction (XRD) was used to investigate the surface morphologies and orientations of the composite nanorod arrays. With densely packed ZnO nanorod arrays as a unique support structure, the LSCO thin film coated on top has exhibited a better photocatalytic property over the ZnO nanorod arrays and LSCO thin film deposited on flat Si substrate. With optimization over the structure, dimensionality, packing density, as well as the composition and interface structure, these unique composite nanoarchitectures could be a promising class of photocatalyst candidates for organic molecule degradation.

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