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FABRICATION OF PHOTOCATALYTIC P-N NANODIODES FOR EFFICIENT SOLAR ENERGY CONVERSION TO HYDROGEN

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Much attention has been paid to photocatalytic water splitting, since H_2 with the high energy capacity could be obtained directly from renewable water and solar light. Photocatalysts working under visible light irradiation should have a small band gap energy (<3.0 eV) corresponding to visible light irradiation (λ> 400 nm). Furthermore, their band position should be located such that simultaneous oxidation and reduction of water is energetically possible. Among a number of approaches to fabricate visible light photocatalysts, we found that composite photocatalysts combining multiple functions of component catalysts were very promising. In particular, the fabrication of the composite materials by using modern nanostructured-materials processing techniques was found fruitful. Thus we discovered that a group of layered perovskite compounds containing Pb and/or Bi that exhibited high visible light activity for water splitting. Now these materials were employed as the base materials for composite fabrication. The composites were fabricated in configurations of a *p-n* nanodiode structure, *i.e.* *p*-semiconductor/*n*-semiconductor and *p*-semiconductor/metal/*n*-semiconductor, or just the simple combination of two semiconductors with different optical properties. All these composite photocatalysts showed greatly enhanced photocatalytic activity relative to single-component photocatalysts.