

Development of novel oxide solid solution as the band-engineered photocatalyst

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We report that band structure-controlled ZnO-Ga₂O₃-In₂O₃ system solid solutions function as a photocatalyst under visible light irradiation. Making solid solution between two or more semiconductors with different band gap is one of band engineering skill to control the band (energy) structure of target material (photocatalyst). By making solid solution between semiconductor with wide band gap and other semiconductor with narrow band gap, new semiconductor with the intermediate band structure is developed. Both band positions are controlled by making solid solution. In this paper, it was suggested that the conduction band maximum consists of hybrid orbitals of In 5s5p, Ga 4s4p and Zn 4s4p, and the valence band minimum consists of hybrid orbitals of O 2p and Ag 3d.