Rh および Ru を微量ドープした $SrTiO_3$ 単一粒子型光触媒を用いた可視光水分解

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Water Splitting under Visible Light Irradiation over $SrTiO_3$ Doped in a Tiny Amount of Rh and Ru as a Single Particulate Photocatalyst

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We have reported that Rh- and Sb-codoped $SrTiO_3$ ($SrTiO_3$:Rh,Sb) as a single particulate photocatalyst shows water splitting activity under visible light irradiation, and a $SrTiO_3$:Ru,Sb photocatalyst shows the sacrificial H_2 and O_2 evolution under visible light irradiation. However, the water splitting activity over the $SrTiO_3$:Rh,Sb photocatalyst is still low, and the water splitting under visible light irradiation over $SrTiO_3$:Ru,Sb as a single particulate photocatalyst have not been achieved yet. Recently, we have reported that the water splitting activity under visible light irradiation over $SrTiO_3$:Ir,Sb as a single particulate photocatalyst was remarkably enhanced by doping in a small amount of dopants into $SrTiO_3$, treating with $SrCl_2$-flux, and loading a $RhCrO_x$ cocatalyst. In the present study, we investigated the water splitting activity over $SrTiO_3$:Rh,Sb and $SrTiO_3$:Ru,Sb photocatalysts treated by these strategies. As a result, we have successfully improved the water splitting activity over a $SrTiO_3$:Rh,Sb photocatalyst under visible light irradiation and have achieved the highly efficient water splitting under visible light irradiation over a $SrTiO_3$:Ru,Sb photocatalyst.

Keywords : Water splitting; Visible light; Metal oxide; Doping in a tiny amount of dopants; Flux treatment

当研究室では，Rh,Sb 共ドープ $SrTiO_3$($SrTiO_3$:Rh,Sb)光触媒が単一粒子型可視光水分解に活性を示すこと[1]，および $SrTiO_3$:Ru,Sb 光触媒が可視光照射下において犠牲試薬を含む水溶液からの水素および酸素生成に活性を示すこと[2]を報告してきた．しかし，$SrTiO_3$:Rh,Sb 光触媒を用いた可視光水分解活性は低く，$SrTiO_3$:Ru,Sb 光触媒を用いた単一粒子型可視光水分解は未達成である．ここで，微量ドーピング，$SrCl_2$ フラックス処理[3]，および $RhCrO_x$ 助触媒担持[4]によって，$SrTiO_3$:Ir,Sb 光触媒を用いた可視光水分解の高活性化に成功している[5]. そこで本研究では，上記の手法による $SrTiO_3$:Rh,Sb および $SrTiO_3$:Ru,Sb 光触媒を用いた可視光水分解の高活性化を目的とした．その結果，$SrTiO_3$:Rh,Sb 光触媒の可視光水分解活性が大きく向上した．また，$SrTiO_3$:Ru,Sb 光触媒を用いた高効率な可視光水分解を達成した．

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