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Creation of Highly Active Water-Splitting Photocatalyst by Controlling Cocatalyst

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PURPOSE OF THE ABSTRACT
Water-splitting photocatalysts are generally composed of a semiconductor photocatalyst and metal nanoparticle co-catalyst that acts as the reaction site. Effective strategies to achieve highly active photocatalysts include improving the semiconductor photocatalyst and the co-catalyst. We are striving to accurately control the co-catalyst by utilizing precisely regulated metal clusters synthesized using a liquid-phase method to impart high activity to the water-splitting photocatalyst. Herein, we report a study on a gold (Au) cluster?supported BaLa4Ti4O15 photocatalyst. In this study, first, the influence of refining Au cluster co-catalyst particles on the water-splitting reaction was clarified at an elementary reaction level. As a result, we found that suppressing the back reaction is an important factor to achieve high activity by refining the co-catalyst. Then, we formed a Cr2O3 shell on the Au cluster co-catalyst particles (Au25) to prevent the back reaction. The resulting water-splitting photocatalyst was highly active and stable, exhibiting activity about 19 times higher than that of Au25-BaLa4Ti4O15 without a Cr2O3 shell (Figure 1).

FIGURES

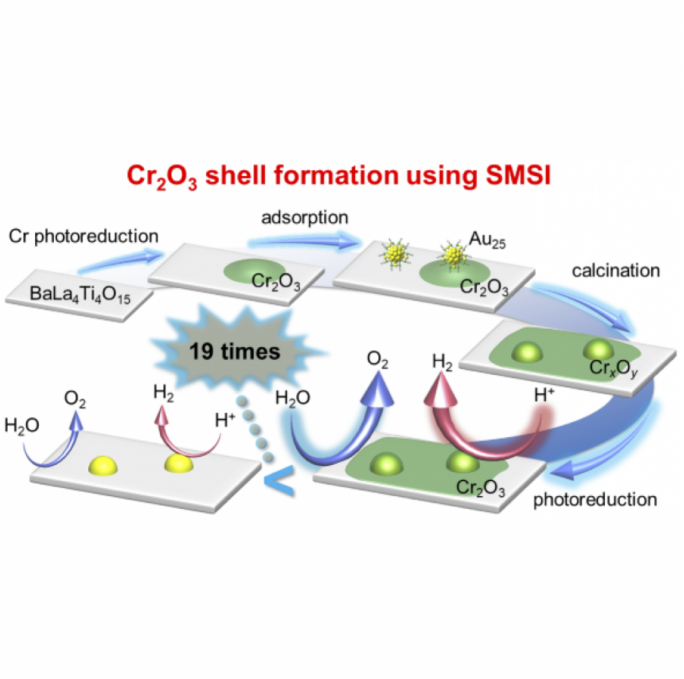

FIGURE 1

Figure 1

Schematic of this study.

FIGURE 2

KEYWORDS

Water-Splitting Photocatalysts | Co-catalysts | Metal Clusters | Activation

BIBLIOGRAPHY