Suppression of the water splitting back reaction on GaN:ZnO photocatalysts loaded with core/shell cocatalysts, investigated using a μ-reactor

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Using silicon-based l-reactors, we have studied the photocatalytic water splitting reaction and the catalytic back reaction on the same catalysts. GaN:ZnO without cocatalyst and loaded with Rh, Pt, Cr2O3/Rh, Cr2O3/Pt, and Rh–Cr mixed oxide has been tested for gas-phase photocatalytic water splitting. The results confirm the high activity observed in liquid-phase experiments with Cr2O3/Rh and Rh–Cr mixed oxide as cocatalysts. To investigate the reason of this enhanced activity, the back reaction was studied by reacting stoichiometric H2/O2 and monitoring the water molecules produced. The comparison of the two experiments shows that the suppression of the back reaction with the core/shell cocatalysts and the Rh–Cr mixed oxide corresponds to an increase in the net photocatalytic water splitting activity. The fact that the back reaction is not completely suppressed with Cr2O3/Pt compared to Cr2O3/Rh may be the cause of the higher net activity of the Cr2O3/Rh.

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