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Dye-sensitized solar cells with metal selenides as electrocatalysts

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As one of the key materials in dye-sensitized solar cells (DSSCs), the counter electrode (CE) plays a crucial role in completing the electric circuit by catalyzing the reduction of the oxidation state to the reduction state for a redox couple (e.g. I3-/I-) in the electrolyte at the CE/electrolyte interface. To lower the cost caused by the typically used Pt CE, which restricts the large-scale application due to its low reserves and high price, great effort has been made on developing new CE materials alternative to Pt. Metal selenides have been widely used as the electrocatalysts of oxygen reduction reaction and the light-harvesting materials for solar cells. Our group first expanded their applications to the DSSC field by using in situ growth Co0.85Se nanosheet and Ni0.85Se nanoparticle films as the CEs.1 This finding has inspired extensive studies on developing new metal selenides in order to seek more efficient CE materials for low-cost DSSCs. Metal selenide CEs can be prepared via several methods, among which the in situ growth strategy is superior to other methods, because it offers more homogeneous dispersion on the substrate, stronger adhesion to the substrate, and more effective catalytic sites. The effects of morphology and stoichiometric ratio on the electocatalytic and photovoltaic performance are discussed in this paper (Image).2 It is found that metal selenides demonstrate excellent catalytic activity with low-cost and good stability, and they will become strong competitors as CE materials for large-scale applications.

Biography

Zhong-Sheng Wang has completed his PhD from Peking University, China. He is currently the Professor at the Department of Chemistry, Fudan University, China. He has published 116 papers in reputed journals with citations of 10300 and h-index of 48 and has been serving as an editorial board member of Nano.

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