

Template synthesis of core-shell WS_2 @N/C nanocage Multifunctional Electrocatalysts for Dye sensitized solar cells

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Dye-sensitized solar solar and efficient oxygen reduction play an indispensable role in various energy conversion devices due to its acceptable energy conversion efficiency, low-cost and simple production.The counter electrode (CE) plays a crucial role collects electrons from the external circuit and reduces the tri-iodide to iodide species by converting tri-iodide generated at the anode back to iodide, which has a significant influence on the photovoltaic performance. [1] platinum (Pt) is normally used as the CE for reducing the I_3^- redox species,and cobalt(II/III) electrolyte and zinc porphyrin dye achieved a highest power conversion efficiency of 12%.[2]However,Pt is an expensive and scarce material. Therefore, it is highly desired to seek for sustainable alternative materials for platinum group metals.[3]

2D transition metal dichalcogenides (TMDs) analogous structure like graphite,it structure is composed of three atomic layers, a W layer sandwiched between two S layers, and the triple layers are stacked by weak van der Waals interaction.[4]Wu et al,used commercial WS_2 as a CE material for DSSCs. They demonstrated that WS_2 was a good candidate to replace a Pt CE in DSSCs.WS_2 is undoubtedly a hopeful material for catalyzing the reduction of I^{3-}.[5]

Metal-organic framework (MOF) synthesized by the assembly of metal nodes and organic linkers, have emerged as promising materials for diverse applications due to their high porosity and ultrahigh surface area.[6]Calcinate the MOF material at high temperature,get the N-doped hollow carbon nanocages.TMDs combined with MOF templating synthesis of few-layered WS_2 Nanoplates confined in Metal-organic framework Nanocaqes for dye-sensitized solar cells as the counter electrode.[7]

References

[1] Jihuai Wu, Zhang Lan, Jianming Lin, et al. Counter electrodes in dye-sensitized solar cells[J]. Chemical Society Reviews, 46(2017)5975-6023.

[2] Yella A, Lee HW, Tsao HN, Yi CY, Chandiran AK, Nazeeruddin MK, et al. Porphyrin-sensitized solar cells with cobalt (II/III)- based redox electrolyte exceed 12 percent efficiency. Science 2011;334:629 – 34.

[3] Z. Jin,M.Zhang,M.Wang,C.Feng,Z.-S.Wang,Metal selenides as efficient counter electrodes for dye-sensitized solar cells,Acc. Chem. Res. 50 (2017)895-904.

[4] Tenne R, Margulis L, Genut M, Hodes G. Polyhedral and cylindrical structures of tungsten disulphide. Nature 1992;360:444–6.

[5] Wu MX, Wang YD, Lin X, Yu N, Wang L, Wang L, et al.Economical and effective sulfide catalysts for dye-sensitized solar cells as counter electrodes. Phys Chem Chem Phys 2011;13:19298–301.

[6] H. Furukawa, K.E. Cordova,M.O'Keeffe,O.M.Yaghi,Science 2013,341, 1230444.

[7] Xu C , Zhang J , Qian X , et al. Template synthesis of cobalt molybdenum sulfide hollow nanoboxes as enhanced bifunctional Pt-free electrocatalysts for dye-sensitized solar cells and alkaline hydrogen evolution[J]. Electrochimica Acta, 2018, 289:448-458.

Biography

Yanfang Gao has completed her PhD at the age of 30 years from Fukui University and postdoctoral studies from Tsinghua University of Chemistry. She is a professor at the department of Inner Mongolia University of Technology,a tutor of a phD student.She has published more than 20 papers in reputed journals.

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