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## Full Length Article

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# **Nitrogen and sulfur dual-doped chitin-derived carbon/graphene composites as effective metal-free electrocatalysts for dye sensitized solar cells**

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## **Abstract**

The photovoltaic performance of dye-sensitized solar cell (DSSC) is strongly influenced by the electrocatalytic ability of its counter electrode (CE) materials. To obtain the affordable and high-performance electrocatalysts, the N/S dual-doped chitin-derived carbon materials SCCh were manufactured via in-situ S-doped method in the annealing process, where richer active sites are created compared to the pristine chitin-derived carbon matrix CCh, thus enhancing the intrinsic catalytic activity of carbon materials. When SCCh is incorporated with graphene, the yielded composites hold a further boosted catalytic activity due to facilitating the electronic fast transfer. The DSSC assembled with the optimizing rGO-SCCh-3 composite CE shows a favourable power conversion efficiency of 6.36% , which is comparable with that of

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