Facile synthesis of Co_3O_4 microspheres and Co_9S_8 nanoparticles grown on N, S co-doped reduced graphene oxide as an electrocatalyst for oxygen reduction reaction

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For fuel cells, it is highly desirable to explore highly efficient and low-cost electrocatalyst for oxygen reduction reaction (ORR). First-row transition metal oxides and sulphides have been extensively explored as electrocatalysts for ORR in the alkaline medium due to its low-cost, easy accessibility and abundance. Moreover, the coupling of transition metal oxide and sulphides with doped reduced graphene oxide (rGO) is an effective strategy to improve the electrocatalytic activity and stability due to the enhanced electrical conductivity, surface area and active sites. In view of this, we report a facile one-step approach for the synthesis of Co3O4 microspheres grown on N, S co-doped rGO. Interestingly, by simply tuning the concentration of sulphur source we are able to convert the Co3O4 microspheres into Co9S8 nanoparticles wrapped with N, S co-doped rGO. Further, the ORR activity of these composites has been exploited in alkaline medium which has been compared with N, S co-doped rGO, pure Co3O4 microspheres, pure Co9S8 nanoparticles and commercial Pt/C.