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Microwave-assisted synthesis of cobalt sulphide nanoparticles clusters on activated graphene foam for electrochemical supercapacitor

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Cobalt sulphide (Co9S8) nanoparticles clusters embedded in activated graphene foam (AGF) structure were prepared using microwave-assisted hydrothermal synthesis. Morphological characterization of as-prepared Co9S8/AGF showed that Co9S8 composed of cluster (sphere)-like nanoparticles embedded in the matrix of a porous sheet-like AGF. The synergy between the Co9S8 nanoparticles and AGF in the Co9S8/AGF composite showed predominantly an improvement in the porous nature (surface area and pore volume) of the Co9S8 and the electrical conductivity of the composite electrode. The composite exhibited a specific capacitance of 1150 F g-1 as compared to Co9S8 with specific capacitance of 507 F g-1 at a scan rate of 5 mV s-1 and good cycling stability in 6 M KOH electrolyte. Co9S8/AGF composite showed significant improvement on the specific capacitance compared to pure Co9S8 and specific capacitance values found in previously published reports by other studies for cobalt sulphide-based composites.

Summary

Cobalt sulphide (Co9S8) nanoparticles clusters embedded in activated graphene foam (AGF) structure were prepared using microwave-assisted hydrothermal synthesis. Morphological characterization of as-prepared Co9S8/AGF showed that Co9S8 composed of cluster (sphere)-like nanoparticles embedded in the matrix of a porous sheet-like AGF. The synergy between the Co9S8 nanoparticles and AGF in the Co9S8/AGF composite showed predominantly an improvement in the porous nature (surface area and pore volume) of the Co9S8 and the electrical conductivity of the composite electrode. The composite exhibited a specific capacitance of 1150 F g-1 as compared to Co9S8 with specific capacitance of 507 F g-1 at a scan rate of 5 mV s-1 and good cycling stability in 6 M KOH electrolyte. Co9S8/AGF composite showed significant improvement on the specific capacitance compared to pure Co9S8 and specific capacitance values found in previously published reports by other studies for cobalt sulphide-based composites.

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