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One-step electrodeposition for fabricating graphene-based hierarchical architectures

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As a rising star in the carbon family, graphene has attracted a great deal of attention in recent years because of its excellent electronic, conductive and mechanical properties, superior chemical stability and high specific surface area, as well as its potential applications in photocatalysis, energy storage, sensors, and solar cells. Recently, graphene-based composite fabrication has been a hot research topic. The introduction of new components has planted new functionalities in graphene. In particular, one attractive challenge is currently to fabricate specified architectures of graphene-base composites, and therefore a number of strategies have been put forward for the fabrication of graphene-based nanostructures. Graphene–based nanocomposites have typically been prepared by chemical or thermal reduction of mixtures of graphene (or graphene oxide) and new component precursors. Obviously, these methods involve highly toxic chemicals, high temperature, impurity, and multiple steps. Recently, we have successfully developed one-step co-electrodeposition method to fabricate graphene-based nanocomposites with craved architectures. Because the electrochemical techniques are applicable to a variety of materials, including organic, inorganic, biological, and polymeric molecules, this environmentally friendly and high-efficiency technology is generally applicable and could lead to a range of graphene-based composites with excellent properties and improved functionalities due to the synergetic effects between graphene and other components, and therefore the nanostructures have been widely used in the fields of electronics, energy storage, photocatalysis, solar cells, and sensors.

Biography

Chengbin Liu has completed his PhD from Chinese Academy of Sciences and Postdoctoral studies from Fudan University and National University of Singapore. He is a Professor of chemistry and the head of Water Pollution Control Technology Center, Hunan University. He is the assessment expert of NSFC and NPST, and the member of Chinese Chemical Society. He has got "CAS President" excellent award from Chinese Academy of Sciences, "New Century Excellent Talents in University" from Education Department of China, and Hunan Province Outstanding Young Scholar. He has published over 50 papers in reputed journals and 2 books.

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Optically probing copper levels in Cu:ZnSe quantum dots

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Copper doping in ZnSe (Cu:ZnSe) quantum dots (QDs) reveal remarkable photoluminescence (PL) with the ability to tune the emission properties from blue to green region, simply by increasing the size of the QDs. A high temperature wet chemical route is employed to synthesize Cu:ZnSe QDs which allows easier incorporation of copper ions into host ZnSe lattice. The amount of dopant (in solution) was kept fixed in all four different sized Cu:ZnSe QDs. It was observed that the amount of dopant incorporated into the host lattice goes on increasing with increase in size. A red shift in the optical absorption of Cu:ZnSe QDs compared with undoped ZnSe QDs, is observed. PL measurements revealed both band edge as well as copper related emission. Delocalization of electronic wave-function leads to red shift in the copper related emission with increase in size. In the photoluminescence excitation spectra, copper related feature is observed between 344-377 nm and is attributed to direct excitation of Cu^{2+} dopant.

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