Surface modification of graphene oxide flakes with copper sulfide nanophases aiming at applications in photocatalysis

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Semiconductor nanocrystals (NCs) have been extensively explored due to their unique size dependent optical and electronic properties, which are of interest in a number of applications including photocatalysis [1]. In particular, copper sulphide has been investigated as a photocatalyst of interest due to the ability to harvest photons efficiently in the visible spectral region, exhibiting a band-gap (E_g 1.2-2.2 eV), which is dependent on the crystalline phase present [2]. On the other hand graphene based materials have also attracted great importance due to their unique properties [3]. The implementation of chemical routes aiming to combine these two types of materials opens new routes for the development of innovative nanodevices. For example, the combination of graphene oxide with copper sulphide materials has been reported as a promising strategy for the development of hybrid photocatalysts [4]. In this context, we have investigated the *in situ* growth of copper sulphide ($Cu_{2-x}S$) nanocrystals, in the presence of graphene oxide (GO) flakes dispersed in ethanol, by the sonolytic degradation of dissolved Cu(II) dialkyldithiocarbamate complexes. The new materials were firstly tested as photocatalysts using a visible light photoreactor and an organic dye as the water contaminant model. The photocatalytic activity of the hybrid photocatalysts will be discussed on the basis of relevant literature, namely by putting in perspective their application in the photodegradation of emergent pollutants such as pharmaceutical compounds dissolved in water.

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