Sustainable synthesis of transition metals/graphene oxide nanocomposites by electron beam irradiation

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Graphene is nanomaterial with unique physical and chemical properties that makes it a precursor for the synthesis of new materials, such as conductive nanocomposites. Graphene can be obtained by the reduction of graphene oxide, but when it is incomplete, reduced graphene oxide (rGO) is produced with both graphene and graphene oxide properties: it is electrical and thermal conductor, it can be exfoliated in several polar solvents and moreover, the oxygen groups can later be functionalized, affording nanocomposites for electrochemical applications and also in biomaterials.
A method of increasing the electrical conductivity of graphene-based compounds is by the incorporation of metallic nanoparticles. When these nanomaterials are joined together the surface area increases for the passage of electric current and the electrical conductivity. The chemical reduction method for the incorporation of metallic nanoparticle on GO involves toxic reagents or it is a time-consuming and it also requires high costs for the removal of excess reagents and by-products.
The general synthesis of transition Metal/graphene-based nanocomposites by the electron beam in a sustainable process will be presented. The experiments were performed in a 1.5 MeV electron accelerator at room temperature and no hazardous wastes were generated. The nanocomposites were characterized by FT-IR, DRX and TEM/EDS as metallic nanoparticle at the average size of 5-20 nm incorporated into reduced graphene oxide layers. The electrochemical behavior of these nanocomposites was evaluated by cyclic voltammetry.