

Doctorant : Laroussi CHAABANE

Laboratoire : Ingénierie des Matériaux Polymères- Université Claude Bernard
Lyon 1

Encadrants : Emmanuel BEYOU, Mohamed Hassen V BAOUAB

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Titre : Functionalization of graphene oxide sheets with magnetite nanoparticles for the adsorption of copper ions and investigation of its potential catalytic activity toward the homocoupling of alkynes under green conditions.

Problématique et contexte de la thèse

In this research, graphene oxide (GO) was modified by ethylenediamine (GO-EDA) and was followed by grafting of chloroacetylchloride (GO-EDA-CAC). Then, (GO-EDA-CAC) improved by grafting of N,N-bis(2-pyridylmethyl)amino group (BPED) and combined with Fe₃O₄NPs to produce of the material [(GO-EDA-CAC)@Fe₃O₄NPs-BPED]. Moreover, [(GO-EDA-CAC)@Fe₃O₄NPs-BPED] was used for the removal of Cu(II) ions from aqueous solutions using a batch process. The effect of pH, contact time and temperature on the metal ions adsorption were investigated. The maximum adsorption capacity values of Cu(II) on the [(GO-EDA-CAC)@Fe₃O₄NPs-BPED] at pH 7 is 3.808 ± 0.125 mmol.g⁻¹. In addition, it was shown that the adsorption behaviour processes of Cu(II) ions onto both the (GOEDACAC)@Fe₃O₄NPs and [(GO-EDA-CAC)@Fe₃O₄NPs]-BPED adsorbents correspond to a pseudosecond-order kinetic model and Jossens isotherm model. Nevertheless, the calculated thermodynamic parameters indicated that the adsorption behaviour of Cu(II) ions onto the [(GO-EDACAC)@Fe₃O₄NPs]-BPED adsorbent was spontaneous and exothermic process contrary to the adsorption process onto the (GO-EDACAC)@Fe₃O₄NPs adsorbent which was endothermic. Moreover, the recyclability of the magnetic GO-based adsorbents was checked and the removal of the Cu(II) ions from aqueous solutions did not change significantly even after ten adsorption/desorption cycles. Based on these results, we reported the activity of Cu(II) supported on [(GO-EDA-CAC)@Fe₃O₄NPs-BPED] as catalyst for the cross-coupling of symmetric alkynes under green conditions