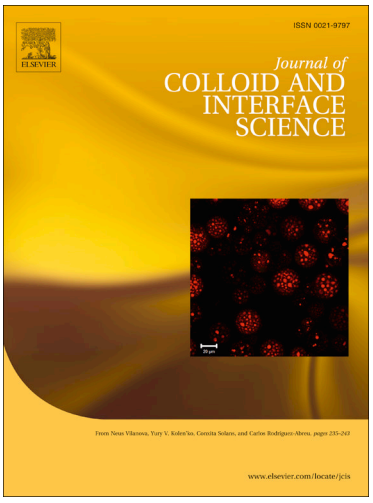

Magnetic Ugi-Functionalized Graphene Oxide Complexed with Copper Nanoparticles: Efficient Catalyst toward Ullman Coupling Reaction in Deep Eutectic Solvents

Ahmad Shaabani, Ronak Afshari

PII: S0021-9797(17)31120-7
DOI: https://doi.org/10.1016/j.jcis.2017.09.089
Reference: YJCIS 22841

To appear in: *Journal of Colloid and Interface Science*

Received Date: 25 July 2017
Revised Date: 21 September 2017
Accepted Date: 22 September 2017

Please cite this article as: A. Shaabani, R. Afshari, Magnetic Ugi-Functionalized Graphene Oxide Complexed with Copper Nanoparticles: Efficient Catalyst toward Ullman Coupling Reaction in Deep Eutectic Solvents, *Journal of Colloid and Interface Science* (2017), doi: https://doi.org/10.1016/j.jcis.2017.09.089

Magnetic Ugi-Functionalized Graphene Oxide Complexed with Copper Nanoparticles: Efficient Catalyst toward Ullman Coupling Reaction in Deep Eutectic Solvents

Ahmad Shaabani∗and Ronak Afshari

Faculty of Chemistry, Shahid Beheshti University, G. C., P. O. Box 19396-4716, Tehran, Iran

∗ Corresponding author. Tel.: +982129902800; e-mail: a-shaabani@sbu.ac.ir

Abstract

Herein, we report the direct synthesis of carboxamide-functionalized graphene oxide (carboxamide-*f*-GO) for the development of new nanocatalysts, with highly dispersed particles, through covalent functionalization with a facile and direct strategy. This surface functionalization was carried out through a one-pot sequential four-component Ugi reaction. Subsequently, the Ugi-ligand decorated on the surface of the graphene oxide sheets coordinated with copper nanoparticles (Cu NPs) and finally covered with magnetic nanoparticles. The synthesized nanocatalyst was characterized by Fourier transform infrared (FT-IR), proton nuclear magnetic resonance spectroscopy (^{1}H NMR), X-ray powder diffraction (XRD), scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), dynamic light scattering (DLS), thermogravimetric analysis (TGA) and atomic force microscopy (AFM). The carboxamido nitrogen in Ugi-ligand showed high affinity toward complexation with Cu NPs and has a profound effect on the reactivity of the copper center in this nanocatalyst. The catalytic activity of nanocatalyst was investigated in Ullmann cross-coupling reaction for practical and direct access to corresponding *N*-aryl amines in a deep eutectic solvent as a green and recyclable media. The results showed the capability of this designed catalytic system through *N*-arylation of *N*-heterocycles and aniline derivatives with high yields in short reaction times. In addition, both of the nanocatalyst and deep eutectic solvent were easily recovered and reused for five consecutive runs.

Keyword: Graphene oxide, Ugi four-component reaction, Nanocatalyst, Deep eutectic solvent, Ullman C-N coupling, Dispersity