

In situ preparation and characterization of novel CuI-functionalized poly[(methyl methacrylate)-*co*-maleimide] as an efficient heterogeneous catalyst in the region selective synthesis of 1,2,3-triazoles via click reaction

N. Pourmohammad, Sh. Ahmadi

Iran Polymer and Petrochemical Institute, Tehran, Iran

Keywords

Nano catalyst; polymer-supported catalyst; organometallic catalyst; CuI@[PMMA-*co*-MI] nanocatalyst; Click reaction.

In heterogeneous catalysis, the facile separation, recovery and reusability of the catalysts are of great significance. Therefore, the immobilization of various metals onto different supports is a common strategy for the preparation of various effective heterogeneous catalysts, Nano-size distribution and functionalization of metals allows better dispersion of particles, higher stability and good recycling properties, promoting such systems to act as effective catalysts.

Poly[(methyl methacrylate)-*co*-(maleic anhydride)], or [PMMA-*co*-MAH], is an amorphous engineering thermoplastic with excellent mechanical and optical properties which including active anhydride groups that can be modified with various nucleophilic reagents. This structure can provide an attractive and useful polymer support for the design of various interesting materials and more importantly can be used for the immobilization of a variety of metals for the preparation of a wide range of easily separable and reusable effective heterogeneous catalysts.

Due to our interest in the synthesis and characterization, we initially prepared [PMMA-*co*-MAH] via *in situ* bulk polymerization and characterized with (FT-IR), (¹H-NMR) and (GPC). Then, *co*-polymer functionalized with 4-aminopyridine and modified support was obtained. Next, Copper iodide was immobilized on the polymer surface of [PMMA-*co*-MI] to afford CuI@[PMMA-*co*-MI] as a polymer-supported Cu(I) nanoparticle catalyst. The prepared nanocatalyst was characterized and confirmed with (FT-IR), (¹H-NMR), (TEM), (SEM), (EDAX), (TGA) and (ICP). This copper nanocatalysts was applied for the regioselective click synthesis of 1,4-disubstituted-1*H*-1,2,3-triazoles from benzyl halides, sodium azide and terminal alkynes in water (**Scheme 1**).

Poly(methyl methacrylate)/multiwalled carbon-nanotube (PMMA/MWNT) nanocomposites were readily prepared via in place chemical change evoked by nickel(II) acetylacetonate/methylaluminoxane ($[\text{Ni}(\text{acac})_2]/\text{MAO}$) catalyst. The incorporation of the MWNT into the PMMA enlarged the glass transition temperature and thermal decomposition temperature. The solution-casted films of the nanocomposites dissolved in dichloromethane exhibited terribly high transparency. The introduction of MWNT attenuated the syndiotacticity of the resultant PMMA. The storage modulus of the composite enlarged considerably with enlarged MWNT content within the PMMA matrix, that was abundant on top of that of PMMA/clay nanocomposites at an equivalent wt you look after filler contents. The PMMA-rich layer that sometimes shaped on the coating surface because of the physical phenomenon and wetting characteristics of the MWNT/PMMA matrix provided excessive interactions between the big expanse nanotubes and therefore the PMMA matrix. A facile, high-yielding and easy methodology for the copper-catalyzed synthesis of one,4-disubstituted one,2,3-triazoles in water, mistreatment in place ready copper nanoparticles (NPs) on changed poly(styrene-co-maleic anhydride) [SMA] catalyst, is rumored. The chemical compound support was simply ready from the reaction of SMA with 4-aminopyridine and after underwent reaction with CuI NPs. The catalyst was applied for the preparation of triazoles below air, followed by natural process separation of the merchandise. The polymer-supported catalyst not solely showed high chemical action activity however additionally showed high one,4-regioselectivity for the [3 + 2] Huisgen cycloaddition in water as solvent. The merchandise were obtained in sensible to glorious yields all told cases. The catalyst may be used while not pre-activation and reloaded for a minimum of 5 runs while not vital decrease in its activity. The catalyst was characterised by SEM, energy dispersive spectrum analysis analysis of X-rays, and inductively coupled plasma. Abstract Composite polyvinyl amine–SiO₂ a pair of –Al a pair of O three (PVAm–SiO₂ a pair of –Al a pair of O three) was readily mistreatment 2 totally different strategies (in situ and impregnation). The physical and chemical properties of the catalysts were investigated by FT-IR, XRD, BET, SEM and TGA techniques. The chemical action activity of the composites was compared for the Knoevenagel condensation reaction within the presence of water as solvent. The chemical action activity of the catalyst readily by in place methodology was on top of that of the fertilized methodology. The catalyst was simply ready from cheap materials showing a substantial level of reusability besides excellent activity.

Email ID: n.pourmohammad19@gmail.com