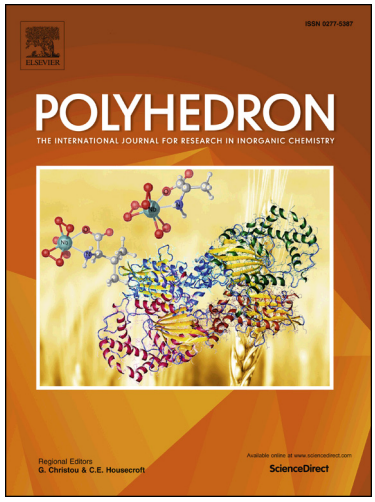

The Bismarck Brown Y based functional polymer-bound palladium nanoparticles as a capable catalyst for the synthesis of *N*-arylsulfonyl cyanamides

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The Bismarck Brown Y based functional polymer-bound palladium nanoparticles as a capable catalyst for the synthesis of *N*-arylsulfonyl cyanamides

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ABSTRACT

The 4-(benzyloxy)benzyl chloride polymer-bound (BBC-Polym) was functionalized with Bismarck Brown Y (BBY: 4,4'-(1*E*,1*E*')-1,3-phenylenebis(diazene-2,1-diyl)dibenzene-1,3-diamine (BBC-Polym@BBY), the corresponding novel nanoparticle Pd catalyst prepared by addition of $PdCl_2$ (BBC-Polym@BBY@Pd), and the catalyst used as an efficient heterogeneous catalyst for the synthesis of a range of *N*-arylsulfonyl cyanamides from the reaction of arylcyanamides with arylsulfonyl chloride at r.t. in EtOH. Recyclability of the catalyst, high yield, short reaction times, and easy work up are the attracting features of this protocol.

Keywords: BBC-Polymer bound, Bismarck Brown Y, palladium nanoparticles, aryl cyanamides, arylsulfonyl chloride, *N*-arylsulfonyl cyanamides

1. Introduction

Homogeneous and heterogeneous palladium catalyst have been extensively studied and used in diverse organic transformations. Homogeneous Pd nanoparticles have usually higher catalytic activity compared to their heterogeneous counterpart due to availability of all the catalytic active sites. However, workers prefer to use the heterogenized system to carry out organic synthesis since the work up is simpler and efficient. Immobilization of palladium nanoparticles on insoluble solid supported materials such as porous silica [1-4], alumina [5], and polymers [6] will produce desired heterogeneous catalysts. Also, mesoporous organic polymers carrying the organic functional groups at their surfaces are ideal to be bound to the active metals producing the heterogeneous catalysts as well [7-16]. In this respect, diversity-oriented organic syntheses were carried out by lots of workers. For example, several polystyrene anchored complexes were prepared and used as catalysts in functionalization of alkenes, namely for oxidative aminations, hydroaminations and several types of oxidations [17]. A series of chelating resin were synthesized by incorporating ethanolamine, 2-mercaptoethylamine, iminodiacetic acid, 8-quinolinol and anthranilic acid into chloromethylated polystyrene-divinyl benzene, and then they were treated with $FeCl_3{\cdot}6H_2O$, $CuCl_2{\cdot}2H_2O$, $CoCl_2{\cdot}6H_2O$ and $NiCl_2{\cdot}6H_2O$ aqueous solution to form the metal complex on the surface. The obtained catalysts were then used for acetalization of carbonyl compounds [18]. A water-soluble polymer-bound Pd(0)-phosphine catalyst was synthesized and used for nucleophilic allylic substitution and in $sp\text{-}sp^2$ coupling reactions of aryl iodides with terminal alkynes