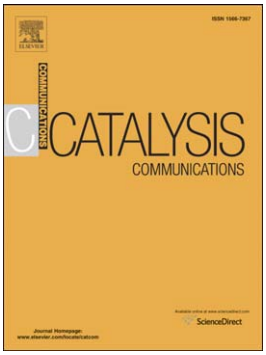

Facile synthesis of palladium nanoparticles supported on silica: An efficient phosphine-free heterogeneous catalyst for Suzuki coupling in aqueous media

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PII: S1566-7367(16)30263-1
DOI: doi: 10.1016/j.catcom.2016.08.005
Reference: CATCOM 4735

To appear in: *Catalysis Communications*

Received date: 26 April 2016
Revised date: 14 July 2016
Accepted date: 2 August 2016

Please cite this article as: Debojeet Sahu, Ana R. Silva, Pankaj Das, Facile synthesis of palladium nanoparticles supported on silica: An efficient phosphine-free heterogeneous catalyst for Suzuki coupling in aqueous media, *Catalysis Communications* (2016), doi: 10.1016/j.catcom.2016.08.005

Facile synthesis of palladium nanoparticles supported on silica: An efficient phosphine-free heterogeneous catalyst for Suzuki coupling in aqueous media

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Abstract A convenient one-step method for synthesizing highly dispersed palladium nanoparticles supported on silica, without taking assistance from any external reductant or stabilizer, has been developed. The supported nanoparticles were characterized by N_2-adsorption desorption, XRD, HRTEM, SEM-EDX, XPS, ICP analyses and applied as catalyst for Suzuki-Miyaura reactions of aryl halides. The reactions with aryl bromides were performed in neat water at room temperature; while the reactions with aryl chlorides were conducted in aqueous-ethanol at 90 ^{o}C. The catalyst could be reused at least three times without compromising with its activity, however from the fourth cycle a progressive decrease in yield was noticed. No aggregation of NPs was observed by the TEM analysis of the six-time used catalyst.

Keywords Palladium nanoparticles; N-ligand; heterogeneous catalyst; Suzuki-coupling; aqueous media; aryl chloride.

1 Introduction

Over the past few decades, remarkable developments have been accomplished in the palladium (Pd) catalyzed Suzuki-Miyaura cross-coupling reaction, which is one of the most popular methods for the construction of carbon–carbon bonds [1-4]. Usually, in most cases homogeneous ligand-based molecular complexes are used as catalysts. Although such homogeneous systems often display amazing activities particularly while dealing with substrates like aryl chlorides, however, their tedious syntheses and high costs pose a serious limitation to their industrial-scale applications [2,5]. Recent examples suggest that Pd nanoparticles (NPs), either in their colloidal form [6,7] or supported on solids [8-11], are attractive alternatives to these molecular catalysts. Compared to colloidal NPs, supported NPs are more advantageous

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