

ORIGINAL PAPER

Synthesis of palladium-bidentate complex and its application in Sonogashira and Suzuki coupling reactions

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A new palladium-bidentate complex [*m*-C₆H₄(CH₂ImMe)₂(PdCl₂)] (*III*) was prepared in two steps. In the first step, [*m*-C₆H₄(CH₂ImMeAgCl)₂] (*II*) (Im = imidazole moiety) was obtained by reacting imidazolium salt [*m*-C₆H₄(CH₂ImMe)₂]Cl₂ (*I*) (prepared by quaternisation of *N*-methylimidazole with 1,3-bis(chloromethyl)benzene) and Ag₂O in CH₂Cl₂. In the next step, treatment of (*II*) with Pd(CH₃CN)₂Cl₂ afforded complex *III* which was evaluated for its catalytic activity for C—C bond-formation reactions by examining the coupling reaction of 3-iodoanisole with phenylacetylene in the Sonogashira reaction. In addition, 3-methoxybiphenyls were obtained with good to excellent yields by Suzuki coupling reactions of 3-iodoanisole with phenylboronic acids or phenylborates salts in the presence of this complex.

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Introduction

N-Heterocyclic carbenes are ligands with affordable and easy synthesis (Wanzlick & Schönherr, 1968). Their coordination to transition metals leads to complexes that are generally more stable than their phosphine analogues (Arduengo et al., 1991; Herrmann, 2002; Nair et al., 2004), and their use in catalysis over the last twenty years has demonstrated performances equal to or even higher than those of the phosphine complexes (Jafarpour & Nolan, 2000). In recent reports, chelating ligands were developed (Flahaut et al., 2006; Mata et al., 2007) allowing the formation of very active complexes by diverse catalytic reactions (Nandurkar et al., 2007; Negishi, 2003). More specifically, these reactions have been widely employed in the synthesis of natural products, and biologically active molecules and materials (Cornils & Herrmann, 2005; Yasuda, 2002).

Many papers are devoted to the properties of various forms of palladium (Pd) compounds and their applications in catalysis (Akiyama et al., 2009; Amini & Etemadi, 2013; Bakherad et al., 2009; Buchmeiser et al., 2001; Corma et al., 2005; Islam et al., 2010; Koukal et al., 2013; Nandurkar & Bhanage, 2008; Phan & Le, 2011; Reddy et al., 2006; Zhang et al., 2009). Particularly, palladium-catalysed coupling of an aryl halide with aryl boronic acid (Suzuki coupling) (Böhm et al., 2000; Inamoto et al., 2009; Kumar et al., 2009; Patil et al., 2009; Weskamp et al., 1999) or with a terminal alkyne (Sonogashira coupling) (Dash et al., 2009; Li & Hor, 2008; Ray et al., 2008) are recognised as the most successful methods of carbon–carbon bond formation (Stauffer et al., 2000).

As reported by Tudose et al. (2006), the precise architecture of Pd species plays a crucial role in designing highly efficient Pd catalyst systems and electronic properties can be tuned by vary-

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