



A study on the applications of 3-amino quinoline complexes of Pd(II) as catalysts for the Suzuki-Miyaura coupling of aryl halides in aqueous and organic media

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ABSTRACT

A novel series of stable phosphine/arsine-free Schiff base Pd(II) complexes (1–3) was synthesized and investigated using a variety of spectroscopic techniques and single crystal X-ray crystallography. A square-planar distortion was observed in all complexes centering on the Pd(II) ion. The isolated complexes (1–3) were used as catalysts for the Suzuki cross-coupling reactions in water/ethanol and water medium, resulting in good to excellent yields of the products even with a little loading of the catalyst. This methodology has the potential to be extended further to develop novel antimicrobial drugs, which can be further used in the treatment of infectious diseases.

1. Introduction

Suzuki cross-coupling reactions are well known as the most widely used synthetic procedures for the formation of carbon–carbon bonds in organic compounds [1–3]. This has led to the Suzuki cross-coupling reactions becoming one of the most successful methods for the preparation of biaryl compounds, including a vast array of natural products and pharmaceuticals [4–13]. It is easy to recognize that there are two important factors that are vital for the successful applications of this coupling reaction. They are: (i) the suitability of the reactions under mild reaction conditions with a wide range of substrates and many functional groups in the total synthesis of complex drug molecules, and (ii) the easy availability of stable and sustainable boronic acid starting materials required for the reactions. Furthermore, it is widely known that soluble palladium complexes have catalyzed Suzuki cross-coupling reactions in both organic solvents and aqueous environments [5]. These homogeneous catalytic methods have been the first choice of chemists for a variety of coupling reactions because of the high activity and selectivity of such catalysts. The presence of phosphines has been found to be beneficial due to their donor capability, but they do have some

drawbacks such as inherent toxicity, air sensitivity, high cost, synthetic challenges, and usage restrictions [14]. Therefore, nitrogen-based ligands are generally considered superior to their phosphine counterparts because they are air stable, economical, and easier to handle [15]. In this context, Pd Schiff base complexes have demonstrated remarkable activity in Suzuki–Miyaura cross-coupling reactions, making them an effective alternative to phosphine analogs [16]. As a result, there has recently been an increased interest in the development of these types of ligands and their palladium complexes. Though most palladium catalysts have been used to activate aryl iodides and bromides, the Suzuki reaction of aryl chlorides has been more difficult due to their ease of availability and low cost. On the other hand, aryl bromides and iodides are substantially more reactive than chloroprene. In this regard, number of outstanding catalytic systems has recently been investigated [17,18].

Herein, the catalytic properties of Schiff-base-containing Palladium complexes (1–3) for Suzuki–Miyaura C–C coupling reactions between phenylboronic acids and a variety of differently functionalized aryl halides are discussed. To the best of our knowledge, we have used a Pd(II) Schiff base complex based on 3-aminoquinoline for the first time as a catalyst in the SMC reaction of 2,4-dichloro-8-methylquinoline

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