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Mesoporous KIT-6 as a support for the immobilization of a palladium organometallic nanocatalyst and its application in C–C coupling reactions

Manzar Akbari[a], Mohsen Nikoorazm[*,a], Bahman Tahmasbi[a] Arash Ghorbani-Choghamarani[b]

[a]*Department of Chemistry, Faculty of Science, Ilam University, P. O. Box 69315516, Ilam, Iran*

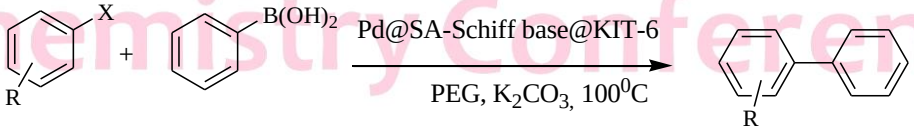
[b]*Department of Organic Chemistry, Faculty of Chemistry, Bu-Ali Sina University, Hamedan, Iran*

* E-mail: e_nikoorazm@yahoo.com, *m.nikorazm@ilam.ac.ir*

Many Pd complexes have been used as homogeneous catalysts in cross-coupling reactions [1]. Although some of the Pd complexes have potential for recycling [2,3], most of them have problems such as deactivation and difficult separation from the solution. Thus, it is necessary to develop heterogeneous catalysts which can easily be recovered from the reaction system and reused [4, 5]. Recently, Ryoo and co-workers reported a new cubic mesoporous silica material named KIT-6, which was prepared using triblock copolymer (P123) as the mesopore directing agent. KIT-6 possesses large readily tunable pores with thick pore walls, high thermal stability, high specific surface area and large pore volume. Therefore, mesoporous KIT-6 can be used as a support for the synthesis heterogeneous catalysts.

In this work, a new Schiff base complex of Pd (II) was fabricated on the surface of KIT-6. For this purpose Schiff-base ligand was synthesized from condensation of diethylenetriamine (DETA) and salicylic aldehyde (SA). In the next step, Schiff-base ligand was reacted with (3-iodopropyl)trimethoxy silane (IPTMS). Then, Schiff base complex of palladium was synthesized using a complexation reaction of $Pd(OAc)_2$. Finally, the obtained palladium complex was fixed on KIT-6 (Pd@SA-Schiff base@KIT-6) as a new reusable and practical catalyst in Suzuki reaction. This catalyst was characterized using IR, BET, EDS, SEM, and TGA methods.

Keywords: Mesoporous silica materials, Nanocatalyst, Suzuki reaction, KIT-6, Schiff base complex, Palladium.



Scheme 1. Carbon-carbon coupling reaction in the presence of Pd@SA-Schiff base@KIT-6

References

[1] B. Tahmasbi, A. Ghorbani-Choghamarani, P. Moradi, *New Journal of Chemistry* **2020**, 44, 3717-3727.
[2] D.Z. Yuan, Q.Y. Zhang, J.B. Dou, *Chinese Chemical Letters* **2010**, 21, 1062-1066.
[3] F. Berthiol, H. Doucet, M. Santelli, *Tetrahedron Letters* **2004**, 45, 5633-5636.
[4] S.S. Prockl, W. Kleist, K. Kohler, *Tetrahedron* **2005**, 61, 9855-9859.
[5] A. Corma, H. Garcia, A. Leyva, A. Primo, *Applied Catalysis A: General* **2004**, 257, 77-83.