

Magnetically recyclable Schiff-based palladium nanocatalyst [Fe₃O₄@SiNSB-Pd] and its catalytic applications in Heck reaction

ABSTRACT

Magnetically recyclable Schiff-based palladium nanocatalyst [Fe₃O₄@SiNSB-Pd] and its catalytic applicatiA magnetically separable palladium nanocatalyst has been synthesized through the immobilization of palladium onto 3-aminopropylphenanthroline Schiff based functionalized silica coated superparamagnetic Fe₃O₄ nanoparticles. The nanocatalyst (Fe₃O₄@SiNSB-Pd) was fully characterized using several spectroscopic techniques, such as FT-IR, HR-SEM, TEM, XRD, ICP, and XPS. The microscopic image of Fe₃O₄ showed spherical shape morphology and had an average size of 150 nm. The Pd-nanoparticles exhibited an average size 3.5 ± 0.6 nm. The successful functionalization of Fe₃O₄@SiNSB-Pd was identified by FT-IR spectroscopy and the appearance of palladium species in Fe₃O₄@SiNSB-Pd was confirmed by XRD analysis. While XPS has been utilized for the determination of the chemical oxidation state of palladium species in Fe₃O₄@SiNSB-Pd. Several activated and deactivated arene halides and olefines were employed for Mizoroki-Heck cross-coupling reactions in the presence of Fe₃O₄@SiNSB-Pd, each of which produced the respective cross-coupling products with excellent yields. The Fe₃O₄@SiNSB-Pd shows good reactivity and reusability for up to seven consecutive cycles.