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Author Name: **Siamaki, Ali R.**

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Highly efficient and recyclable nickel-palladium bimetallic nanoparticles supported on multi-walled carbon nanotubes for copper-free Sonogashira cross-coupling reactions

By: **Siamaki, Ali R.**; Coker, Katherine; Picinich, Lacey

Nickel-palladium bimetallic nanoparticles supported on multi-walled carbon nanotubes (Ni-Pd/MWCNTs) were prepared by dry mixing of the nickel and palladium salts using the mech. energy of a ball-mill. These nanoparticles demonstrated remarkable catalytic activity in Sonogashira cross-coupling reactions with a wide range of functionalized aryl halides and terminal alkynes under ligand and copper free conditions using Monowave 50 heating reactor. The catalyst is air-stable and can be easily removed from the reaction mixture by centrifugation and reused several times with minimal loss of catalytic activity. Furthermore, the concentration of catalyst in Sonogashira reactions can be lowered to a min. amount of 0.01 mol% while still providing a high conversion of the Sonogashira product with an excellent turnover number (TON) of 7200 and turnover frequency (TOF) of 21600 h⁻¹. The Ni-Pd/MWCNTs nanoparticles were fully characterized by a variety of spectroscopic techniques including X-ray diffraction (XRD), transmission electron microscopy (TEM) and XPS. The remarkable reactivity of the Ni-Pd/MWCNTs catalyst toward Sonogashira cross-coupling reactions is attributed to the high degree of the dispersion of Ni-Pd nanoparticles with small particle size of 5- 10 nm due to an efficient grinding method. This work provides a facile, solventless and inexpensive method for large-scale preparation of Ni-Pd/MWCNTs to accomplish often-challenging Sonogashira cross-coupling reactions.

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