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Nickel nanoparticles supported on multi-walled carbon nanotubes for Suzuki cross-coupling reactions in continuous flow

By: [Siamaki, Ali R.](#)

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Cross-coupling reactions are typically carried out under batch reaction conditions in which the reactants and catalyst are charged to a vessel that is then heated for a specified period of time followed by removal of the reaction product mixture. However, it would be difficult to effectively take advantage of the elevated catalytic activity exhibited by the catalyst under batch reaction conditions given the short reaction times required to affect conversion to product. We have recently prepared nickel nanoparticles supported on multi-walled carbon nanotubes (Ni/MWCNTs) by dry mixing of the corresponding nickel salts and multi-walled carbon nanotubes using a mech. shaking of the ball-mill. The method allows for bulk production of Ni/MWCNTs nanoparticles with small particle size of 5- 10 nm ideal for application in batch and continuous flow cross-coupling catalysis. As an alternative approach to batch reactions, we successfully evaluated the Ni/MWCNTs system for Suzuki cross-coupling reactions under continuous flow reaction conditions by which the reactants can be fed onto a catalyst bed at a specified feed rate and reaction temperature while the Suzuki product is continuously recovered. This approach has the addnl. advantage of a significantly greater surface to volume ratio which significantly reduces the catalyst contact time. Furthermore, various functionalized aryl halides and phenylboronic acids can be prepared under continuous flow conditions in high conversion %, a feature which allows for industrial and pharmaceutical applications of this method in future.

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