View Abstract

SUBMISSION ROLE: 2023 Southeastern Regional Meeting

CONTROL ID: 3969993

ABSTRACT SYMPOSIUM NAME: Advances In Metal Catalysis for Organic Synthesis (Invited, Poster)

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TITLE: Nickel nanoparticles supported on multi-walled carbon nanotubes; versatile catalyst for Suzuki cross-coupling reactions in batch and continuous flow

ABSTRACT BODY:

Abstract: Metal catalyzed carbon-carbon bond forming reactions have rapidly become one of the most effective tools in organic synthesis for the assembly of highly functionalized molecules. These reactions have typically been carried out under homogeneous reaction conditions, which require the use of ligands to solubilize the catalyst and broaden its window of reactivity. However, the use of these catalysts under homogeneous conditions has limited their commercial viability due to product contamination as a direct result of inability to effectively separate the catalyst from the reaction product. Ligand-free heterogeneous catalysis presents a promising option to address this problem as evidenced by the significant increase in research activity in this area. We have recently developed a simple, one-step method for the preparation of nickel nanoparticles supported on multi-walled carbon nanotubes (Ni/MWCNTs) under mechanical shaking in a ball-mill. The preparation method is very fast and straightforward which does not require any chemicals, solvents, or additional ligands. The as-prepared nanoparticles demonstrated remarkable catalytic activities in Suzuki cross-coupling reactions of the functionalized aryl halides and phenylboronic acids in batch with a high turnover number in a single catalytic reaction. Batch operations have several inherent limitations that include reproducibility, scalability, and reactor productivity. Continuous flow chemistry has been considered as an alternative approach in academic and industrial processes due to its efficient and innovative synthetic design. Due to the low level of leaching observed in batch reactions as well as remarkable recyclability, the Ni/MWCNTs nanoparticles demonstrated remarkable catalytic activity in Suzuki coupling reactions with a diverse range of functionalized aryl halides and phenylboronic acids under continuous flow conditions. Further optimization of the method including the reaction time, temperature, required solvents, flow rate, and minimum residence time will be discussed in this presentation.

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Reason for Submitting: I am contributing this paper in response to the Call for Papers.

Invited By: (none)

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Registration and Meeting Availability Requirement: I agree.

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Compliance with Law Agreement: I agree to the terms of the Compliance with Law Agreement

Equipment Needs: (none)

Comments to Organizers: (none)

Student Type: Undergraduate Student

Country of Citizenship: (none)

Country of Birth: (none)

Country of Residence: (none)