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Palladium nanoparticles supported on fluorine-doped tin oxide as an efficient heterogeneous catalyst for Suzuki coupling and 4-nitrophenol reduction (Article) (Open Access)

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Abstract

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Abstract: Immobilization of palladium nanoparticles onto the fluorine-doped tin oxide (FTO) as support Pd/FTO, resulted in a highly active heterogeneous catalyst for Suzuki-Miyaura cross-coupling reactions and 4-nitrophenol reduction. The Pd/FTO catalyst has been synthesized by immobilization of palladium nanoparticles onto FTO via a simple impregnation method. ICP-MS analysis confirmed that there is 0.11 mmol/g of palladium was loaded successfully on FTO support. The crystallinity, morphologies, compositions and surface properties of Pd/FTO were fully characterized by various techniques. It was further examined for its catalytic activity and robustness in Suzuki coupling reaction with different aryl halides and solvents. The yields obtained from Suzuki coupling reactions were basically over 80%. The prepared catalyst was also tested on mild reaction such as reduction of 4-nitrophenol (4-NP) to 4-aminophenol (4-AP). Pd/FTO catalyst exhibited high catalytic activity towards 4-NP reduction with a rate constant of 1.776 min^{-1} and turnover frequency (TOF) value of 29.1 hr^{-1}. The findings revealed that Pd/FTO also maintained its high stability for five consecutive runs in Suzuki reactions and 4-NP reductions. The catalyst showed excellent catalytic activities by using a small amount of Pd/FTO for the Suzuki coupling reaction and 4-NP reduction. Graphic abstract: Novel Pd-supported FTO nano-powder catalyst exhibited high activity and selectivity towards C-C Suzuki coupling reaction and nitroarene reduction.[Figure not available: see fulltext.].

SciVal Topic Prominence

Topic: Palladium | Catalysts | Palladium catalyst

Prominence percentile: 99.480

Author keywords

4-NP reduction | Pd/FTO | Suzuki coupling

Indexed keywords

Engineering controlled terms: Catalyst selectivity | Crystallinity | Nanocatalysts | Nanocomposites | Nanoparticles | Palladium | Rate constants | Synthesis (chemical) | Tin oxides

Engineering uncontrolled terms: 4-Nitrophenol reductions | Fluorine doped tin oxide | Heterogeneous catalyst | Impregnation methods | Palladium nanoparticles | Suzuki coupling reaction | Suzuki couplings | Suzuki-Miyaura cross-coupling reaction

Engineering main heading: Catalyst activity

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