

Efficient Ni(II)-Containing Layered Triple Hydroxide-Based Catalysts: Synthesis, Characterisation and Their Role in the Heck Reaction

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Abstract : Nickel can efficiently replace palladium in the Heck, Suzuki and Negishi reactions. This study focuses on the synthesis and catalytic application of Ni(II)-containing layered double hydroxides (LDHs) and layered triple hydroxides (LTHs). Our goals were to incorporate Ni(II) ions among the layers of LDHs or LTHs, or binding it to their surface or building it into their layers in such a way that their catalytic activities are maintained or even increased. The LDHs and LTHs were prepared by the co-precipitation method using ethylene glycol as co-solvent. In several cases, post-synthetic modifications (e.g., thermal treatment) were performed. After optimizing the synthesis conditions, the composites displayed good crystallinity and were free of byproducts. The success of the syntheses and the post-synthetic modifications was confirmed by relevant characterization methods (XRD, SEM, SEM-EDX and combined IR techniques). Catalytic activities of the produced and well-characterized solids were investigated through the Heck reaction. The composites behaved as efficient, recyclable catalysts in the Heck reaction between 4-bromoanisole and styrene. Through varying the reaction parameters, we were able to obtain acceptable conversions under mild conditions. Our study highlights the possibility of the application of Ni(II)-containing composites as efficient catalysts in coupling reactions.

Keywords : layered double hydroxide, layered triple hydroxide, heterogeneous catalysis, heck reaction

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