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A Ni(III) complex stabilized by silica nanoparticles as an efficient nanoheterogeneous catalyst for oxidative C-H fluoroalkylation

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Abstract

© The Royal Society of Chemistry 2016.We have developed NiIII-doped silica nanoparticles ([(bpy)xNiIII]@SiO2) as a recyclable, low-leaching, and efficient oxidative functionalization nanocatalyst for aromatic C-H bonds. The catalyst is obtained by doping the complex [(bpy)3NiII] on silica nanoparticles along with its subsequent electrooxidation to [(bpy)xNiIII] without an additional oxidant. The coupling reaction of arenes with perfluoroheptanoic acid occurs with 100% conversion of reactants in a single step at room temperature under nanoheterogeneous conditions. The catalyst content is only 1% with respect to the substrates under electrochemical regeneration conditions. The catalyst can be easily separated from the reaction mixture and reused a minimum of five times. The results emphasize immobilization on the silica support and the electrochemical regeneration of NiIII complexes as a facile route for developing an efficient nanocatalyst for oxidative functionalization.

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