A Silicon Nanowire Array Stabilized Palladium-Nanoparticle Catalyst

Significance: A silicon nanowire array stabilized palladium-nanoparticle catalyst (SiNA-Pd) for C–H functionalization was developed. Thus, the Mizoroki–Heck reaction of iodobenzene (1, 50 mmol, 10.2 g) and butyl acrylate (2, 2 equiv) proceeded in the presence of SiNA-Pd, Et₃N, and tetra-n-butylammonium acetate (TBAA) to give butyl cinnamate (3) in 95% yield (9.7 g). SiNA-Pd was applied to the C–H functionalization reactions of thiophene 4 and indole 6, the hydrogenation of an alkene, and the hydrosilylation of an enone.

Comment: The turnover number (TON) of SiNA-Pd was 2 × 10⁶ for the reaction of 1 and 2, which is the highest TON for any Mizoroki–Heck reaction with a heterogeneous catalyst. A thromboxane A2 synthesis inhibitor, (2E)-3-[4-(1H-imidazol-1-ylmethyl)phenyl]acrylic acid (ozagrel), was prepared via the SiNA-Pd-mediated Mizoroki–Heck reaction.