Direct Borylation of Arenes Catalyzed by $\gamma$-Fe$_2$O$_3$

Significance: $\gamma$-Fe$_2$O$_3$ magnetic nanoparticles (particle size 58 nm) catalyzed the borylation of arenes with bis(pinacolato)diborane in the presence of di-tert-butyl peroxide and potassium carbonate under air to give the corresponding borylated products in up to 75% yield (10 examples, eq. 1). A sequential reaction via $\gamma$-Fe$_2$O$_3$-catalyzed borylation of benzene and Suzuki–Miyaura coupling with iodoarenes gave the corresponding biaryls in up to 56% yield (4 examples, eq. 2).

Comment: The catalytic activity of $\gamma$-Fe$_2$O$_3$ was superior to that of the other iron catalysts, such as FeCl$_3$, FeBr$_3$, FeF$_3$, Fe(acac)$_3$, Fe$_2$(SO$_4$)$_3$, and Fe$_2$O$_3$. In the borylation of toluene and anisole, the ortho-borylated products were obtained as major regioisomers.