Synthesis of Tetrahydro-4H-chromenes Using Nano $\gamma$-Fe$_2$O$_3$ in H$_2$O

Significance: $\gamma$-Fe$_2$O$_3$ magnetic nanoparticles (nano-$\gamma$-Fe$_2$O$_3$), which were dispersed by ultrasonic irradiation in water, catalyzed the three-component condensation reaction of 1,3-cyclohexanediones, arylaldehydes, and malononitrile to give the corresponding tetrahydro-4H-chromenes in up to 95% yield (14 examples, eq. 1). The dispersed nano-$\gamma$-Fe$_2$O$_3$ was also effective for the four-component reaction of dimeredone, arylaldehydes, $\beta$-keto esters, and NH$_4$OAc to afford the corresponding hexahydroquinoline carboxylates in up to 96% yield (8 examples, eq. 2).

Comment: The catalytic activity of the dispersed nano-$\gamma$-Fe$_2$O$_3$ was superior to that of FeCl$_3$, Fe(NO)$_3$, bulk-Fe$_3$O$_4$, nano-Fe$_3$O$_4$ and non-dispersed nano-$\gamma$-Fe$_2$O$_3$. In the formation of tetrahydro-4H-chromenes, the catalyst was recovered magnetically and reused four times.