Synthesis of Tetrahydro-4H-chromenes Using Nano γ-Fe₂O₃ in H₂O

Significance: γ-Fe₂O₃ magnetic nanoparticles (nano-γ-Fe₂O₃), 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-γ-Fe₂O₃ was also effective for the four-component reaction of dimeredone, arylaldehydes, β-keto esters, and NH₄OAc to afford the corresponding hexahydroquinoline carboxylates in up to 96% yield (8 examples, eq. 2).

Comment: The catalytic activity of the dispersed nano-γ-Fe₂O₃ was superior to that of FeCl₃, Fe(NO)₃, bulk-Fe₃O₄, nano-Fe₃O₄ and non-dispersed nano-γ-Fe₂O₃. In the formation of tetrahydro-4H-chromenes, the catalyst was recovered magnetically and reused four times.

Typical results:

1. 95% yield
2. 85% yield
3. 90% yield
4. 95% yield

Typical results:

1. 92% yield
2. 95% yield
3. 92% yield
4. 96% yield