Enantioselective 1,4-Addition Reactions of Malonic Acid Half-Thioesters to Nitroolefins

**Significance:** An organocatalytic decarboxylative 1,4-addition of malonic acid half-thioesters (MAHTs) to nitroolefins is reported. Several urea-functionalized cinchona alkaloids were screened and epiquinineurea 1 proved to be the most active and selective catalyst. Moreover, different solvents were tested and THF gave the best chemical yields. Electron-deficient aromatic nitroolefins gave better results (yields up to 99%) than their electron-rich counterparts (78% yield). Higher enantioselectivities were obtained when the reactions were performed in ethyl vinyl ether; however, the reaction rate is lower. Nevertheless, in two cases it is shown that after a single recrystallization of the solid 1,4-addition product enantiomeric enrichment with an er of 99.5:0.5 was achieved.

**Comment:** Wennemers and co-workers developed the first organocatalytic enantioselective MAHTs addition reaction to nitroolefins. The reaction was inspired by the enzymes polyketide synthases. Cinchona–urea catalysts prove useful for an ever increasing number of asymmetric reactions. The reactions proceed under mild conditions and tolerate moisture and air. The corresponding γ-nitrothioesters are versatile building blocks. The authors demonstrate the one-pot formation to γ-butyrolactams by reduction of the nitro group and a following intramolecular cyclization. Shair et al. have developed copper-catalyzed decarboxylative aldol reactions of MAHTs (J. Am. Chem. Soc. 2003, 125, 2852). Almost at the same time Ricci and co-workers reported an MAHT addition reaction to imines catalyzed by cinchona alkaloid derivatives (Adv. Synth. Catal. 2007, 349, 1037).