Direct Asymmetric Michael Reactions of Cyclic 1,3-Dicarbonyl Compounds and Enamines Catalyzed by Chiral Bisoxazoline-Copper(II) Complexes^{*}

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Supporting Information

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General Methods

X-ray crystallographic structure for compound **3b**

General methods. The ^1H NMR and ^{13}C NMR spectra were recorded at 400 MHz and 100 MHz, respectively, using CDCl_3 or $(\text{CD}_3)_2\text{SO}$ as solvents and were reported in ppm relative to CHCl_3 ($\delta = 7.26$) for ^1H NMR and relative to the central CDCl_3 ($\delta = 77.00$) or $(\text{CD}_3)_2\text{SO}$ ($\delta = 39.52$) resonance for ^{13}C NMR. Coupling constants in ^1H NMR are in Hz. Flash chromatography (FC) was carried out using silica gel 60 (230-400 mesh). Optical rotations are reported as follows: $[\alpha]_{\text{D}}^{25}$ (c in g per 100 mL solvent). The enantiomeric excess (ee) of the products was determined by chiral stationary phase HPLC as indicated in the respective entries.

4-(4-Chloro-phenyl)-4-(4-hydroxy-2-oxo-2*H*-chromen-3-yl)-2-oxo-butyrac acid methyl ester (3b)