

Supporting Information

Column Asymmetric Catalysis

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General. Unless otherwise stated, all reactions were carried out under strictly anhydrous, air-free conditions. All reagents used are commercially available from Aldrich, Fluka, and Acros Chemicals. The jacketed addition funnels were purchased from ChemGlass. All solvents were dried and distilled by standard procedures. All acid chlorides were distilled by standard procedures. Imine **4** was prepared by a known literature precedent.¹ The ¹H and ¹³C NMR spectra were acquired on a Varian Unity Plus 400 MHz instrument in CDCl₃. The ¹H (400 MHz) and ¹³C (101 MHz) chemical shifts are given in parts per million (δ) with respect to internal TMS standard or residual solvent peaks. Enantiomeric ratios were obtained using a Regis Technologies (*R,R*) Whelk-01 Chiral HPLC column.

General procedure for column catalysis. Two fritted, jacketed columns (each 2 cm wide) were loaded under nitrogen, the top column with the BEMP resin **5** (85 mg, 0.20 mM), the bottom column with catalyst-loaded beads **6** (3 cm). The scavenger resin was loaded into a column and attached to the bottom of the apparatus. All columns were flushed with THF under nitrogen. The BEMP column was cooled to -78 °C with a dry ice/acetone mixture. The catalyst loaded column was cooled to -43 °C with a dry ice/acetonitrile mixture. A solution of phenylacetyl chloride **2** (0.14 mM) in THF (1 mL) was added to the top column and allowed to drip by gravity through the BEMP resin and onto the catalyst-loaded resin of the bottom column. Imino ester **4** (0.13 mM in 0.5 mL THF) was then added through a port onto the lower column. The reaction was initiated by allowing a slow drip of THF from the bottom of the column to allow complete elution of the column contents over the course of two hours. After passing through the scavenger resin the eluted reaction mixture was concentrated to afford crude β-lactam **1** in 91% ee. Crystallization of the residue affords optically and analytically pure material in 65% yield.

Synthesis of 6. Wang resin (2.0 g, 5.06 mM, 2.53 mM/g) was added via addition funnel to a solution of terephthaloyl chloride (2.57 g, 12.7 mM) in 30 mL of THF at 0 °C. Triethylamine (1.74 mL, 12.7 mM) was added and the reaction allowed to warm to RT over 10h. The derivatized resin was filtered off and washed with dry THF under N₂. To a slurry of resin in 10 mL THF at 0 °C was added a solution of quinine (3.28 g, 10.1 mM) and triethylamine (1.56 mL, 11.1 mM). The reaction was allowed to warm to RT over 10 h. The resin was filtered off and washed with 40 mL of methanol. The resin was dried under vacuum for 12 h. Incorporation of quinine catalyst was determined to be 60% based on recovered quinine (2.3 g, 7.1 mM).

***Cis*-(3*R*,4*R*)-1-*p*-toluenesulfonyl-3-phenyl-4-ethoxycarbonyl-azetidinone (1).** Identity and absolute configuration of compound is consistent with literature precedent.²

¹ Tschaen, D. H.; Turos, E.; Weinreb, S. M. *J. Org. Chem.* **1984**, *49*, 5058-5064.

² Taggi, A. E.; Hafez, A. M.; Wack, H.; Young, B.; Drury III, W. J.; Lectka, T. *J. Am. Chem. Soc.* **2000**, *122*, 7831-7832.