Supplementary Material

Spiro[bicyclo[3.2.0]heptane-2,2'-[1,3]dioxolan]-6-one - a versatile intermediate for the synthesis of cyclopentane-derived natural products

Carl R. Johnson,[a] Robert C. Elliott,[b] Gary A. Sulikowski,[c] and Nicholas A. Meanwell[d, *]

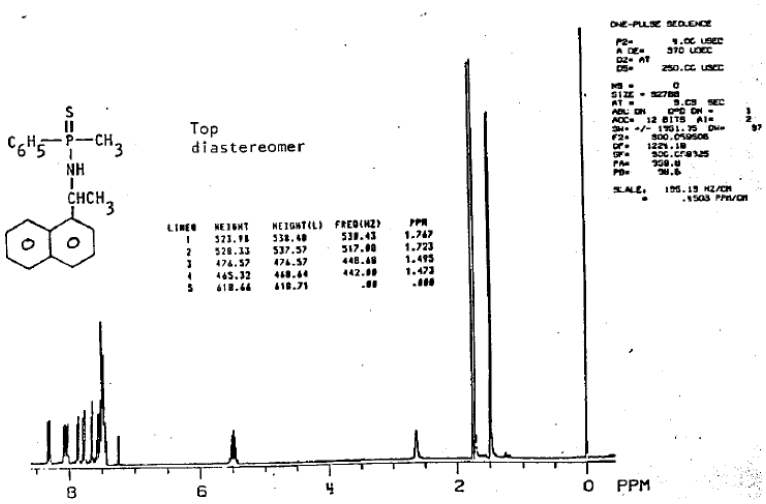
[a]Department of Chemistry, Wayne State University, Detroit, Michigan 48202
[b] J-KEM Scientific, Inc., 858 Hodiamont Ave., St. Louis, MO 63112, USA
[c]Department of Chemistry, Vanderbilt University, Nashville, Tennessee 37235, USA; Vanderbilt Institute of Chemical Biology, Vanderbilt University, Nashville, Tennessee 37232, USA
[d] Baruch S. Blumberg Institute, 3805 Old Easton Rd, Doylestown, PA 18902, USA; School of Pharmacy, University of Michigan, Ann Arbor MI 48109, USA; Ernest Mario School of Pharmacy, Rutgers University New Brunswick, NJ 08854, USA
Email: nicholas.meanwell@gmail.com or nicholas.meanwell@bblumberg.org

Table of Contents

_P_-Methyl-_N_-[1-(1-naphthalenyl)ethyl]-_P_-phenylphosphinothioic amide (7)

A solution of methylphenylphosphinothioic chloride (19.06 g, 0.1 mol) in anhydrous THF (80 mL) was added dropwise to a stirred solution of (+)-(*R*)-1-(1-naphthyl)ethylamine (17.12 g, 0.1 mol) and Et_3N (20.24 g, 0.2 mol) in anhydrous THF (800 mL) maintained at 0 °C. The mixture was stirred for 2 h and then warmed to room temperature. After stirring for 14 h, the mixture was filtered and concentrated to leave an oil which was purified by flash chromatography using hexane and EtOAc (10:1) as eluant. The diastereomers were subsequently separated by preparative MPLC using a mixture of hexane and EtOAc (10:1) as eluant. The more mobile material (12.99 g, 40 %) was isolated as a viscous oil. IR ($CHCl_3$) 3370, 2980, 1298, 1176, 1118, 955, 895 cm^{-1};

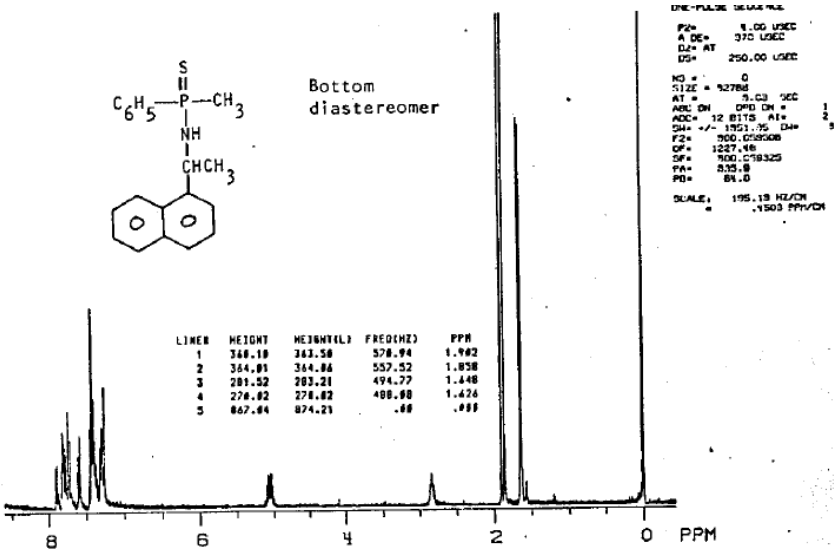
^{1}H-NMR ($CDCl_3$)



$[\alpha]_D$ (25 °C) +11.71° (c = 1.3, $CHCl_3$). Anal. calcd. for $C_{19}H_{20}NPS$: C, 70.13; H, 6.20. Found: C, 70.07; H, 6.05.

Further elution provided the more polar diastereomer as a solid (12.70 g, 39 %), mp 113 °C. IR ($CHCl_3$) 3370, 2980, 1298, 1176, 1118, 955, 895 cm^{-1};

^{1}H-NMR ($CDCl_3$) δ

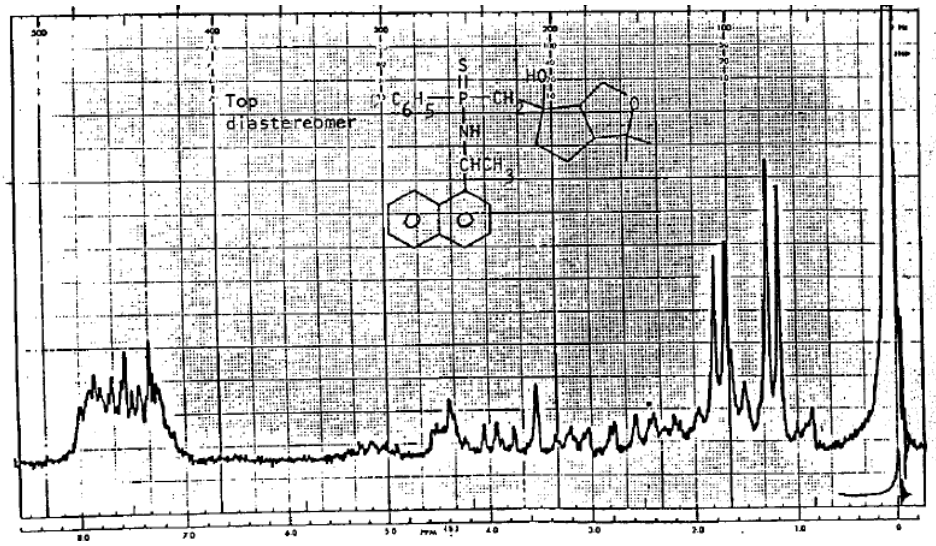


$[\alpha]_D$ (25 °C) +47.07° (c = 0.98, $CHCl_3$). Anal. calcd. for $C_{19}H_{20}NPS$: C, 70.13; H, 6.20. Found: C, 70.08; H, 6.21.

Adducts 32a and 32b

A solution of *n*-BuLi in hexane (11.2 mmol) was added dropwise to a solution of the more polar diastereomer of **7** (1.82 g, 5.6 mmol) in anhydrous THF maintained at -78 °C under an atmosphere of Ar. After 5 min, the mixture was warmed to room temperature, stirred 15 min and then re-cooled to -78 °C. A solution of **6** (0.86 g, 5.6 mmol) in THF (5 mL) was added dropwise, the mixture stirred at -78 °C for 3 h and warmed to 0 °C before being poured onto satd. NH_4Cl solution. The mixture was extracted with Et_2O, the extracts dried over Na_2SO_4 and the solvent removed. The residual white solid was subjected to medium pressure liquid chromatography (MPLC) over silica gel using a mixture of hexane, EtOAc and CH_2Cl_2 (12:3:1) as eluant to give **32a** (0.75 g, 28%), mp 172-173 °C. IR ($CHCl_3$) 3310, 2960, 1440, 1370, 1295, 1175, 1105, 955 cm^{-1};

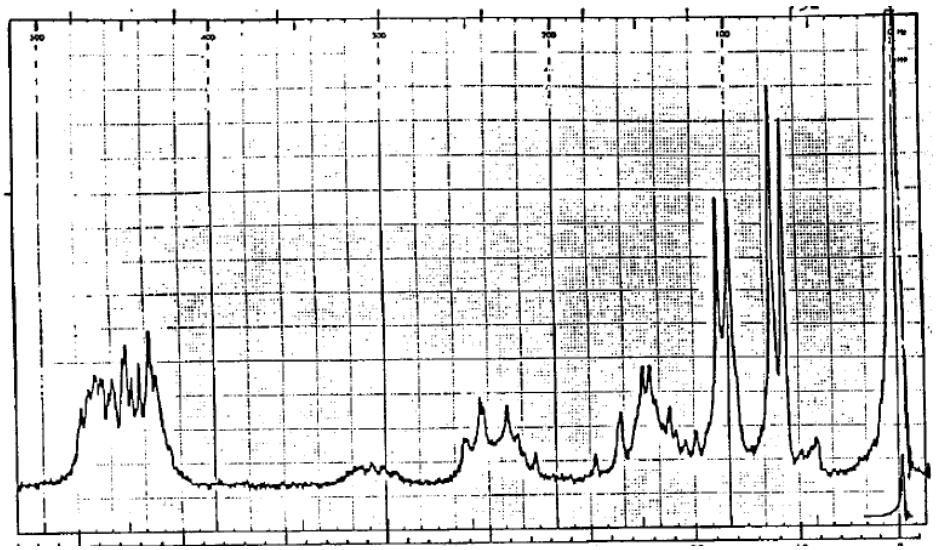
^{1}H-NMR ($CDCl_3$):



$[\alpha]_D$ (25 °C) +14.83° (c = 1, $CHCl_3$). Anal. calcd. for $C_{28}H_{34}NO_2PS$: C, 70.12; H, 7.15. Found: C, 70.18; H, 6.98.

Further elution gave **32b** (0.59 g, 22%). IR ($CHCl_3$) 3310, 2960, 1440, 1370, 1295, 1175, 1105, 955 cm^{-1}

^{1}H-NMR ($CDCl_3$):



$[\alpha]_D$ (25 °C) -32.83° (c = 1, $CHCl_3$). Anal. calcd. for $C_{28}H_{34}NO_2PS$: C, 70.12; H, 7.15. Found: C, 69.98; H, 6.99.