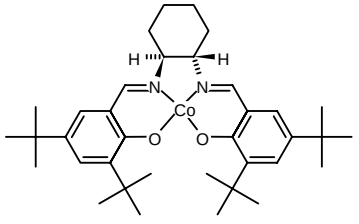
NEW JACOBSEN'S CATALYST

Chiral Co(II) Salen Complex

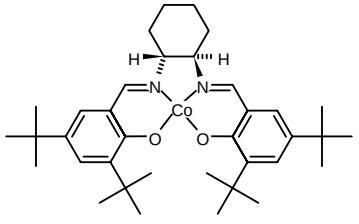
Professor Eric N. Jacobsen and co-workers recently reported a new, remarkably efficient Co salen catalyst (**1**).[1,2] This new catalyst has been used for the hydrolytic kinetic resolution (HKR) of terminal epoxides[1] and for the enantioselective catalytic ring opening of meso epoxides.[2a] Catalytic amounts (1 mol %) of Co(II) salen complex are used in the reactions, and the catalyst can be easily recycled (regenerated with acid). The Co(II) salen complex is converted in situ to the reactive species that appears to be Co(III).

High chemical yields and excellent enantioselectivities are obtained using the Co(II) salen complex for the HKR of a variety of terminal epoxides.[1] Successful HKR have been obtained for terminal epoxides such as propylene oxide, epichlorohydrin, long-chain and aryl epoxides, and 1,2-epoxybutene. The Jacobsen's HKR offers a simple and inexpensive method for the generation of synthetically useful, optically active epoxides and diols.

The chiral Co(II) salen complex is also effective for the asymmetric ring opening of meso epoxides with benzoic acid.[2a] Enantioselectivities of 55-93% were obtained for a variety of substrates which, in general, can be enhanced to 98% ee by simple recrystallization.



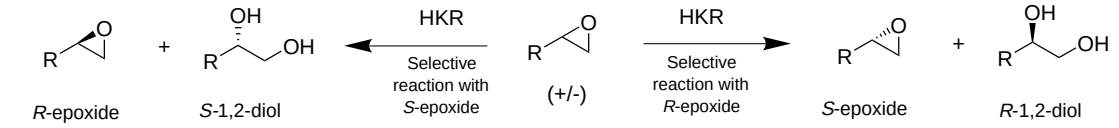
(*S,S*)-1



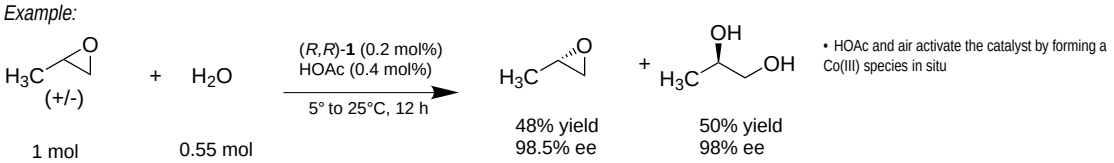
(*R,R*)-1

Kinetic Resolution of Terminal Epoxides[1]

General Scheme:



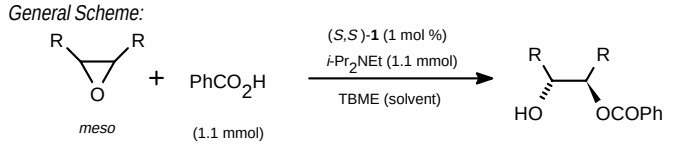
Example:



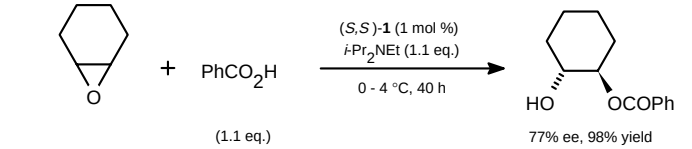
- HOAc and air activate the catalyst by forming a Co(III) species in situ

Enantioselective Ring Opening of meso Epoxides[2a]

General Scheme:



Example:



47,460-6 (*S,S*)-*N,N'*-**Bis(3,5-di-*tert*-butylsalicylidene)-1,2-cyclohexanediaminocobalt(II)**

47,459-2 (*R,R*)-*N,N'*-**Bis(3,5-di-*tert*-butylsalicylidene)-1,2-cyclohexanediaminocobalt(II)**

40,443-8 (*S,S*)-(+)-*N,N'*-**Bis(3,5-di-*tert*-butylsalicylidene)-1,2-cyclohexanediamine,** 98%

40,441-1 (*R,R*)-(–)-*N,N'*-**Bis(3,5-di-*tert*-butylsalicylidene)-1,2-cyclohexanediamine,** 98%

References: (1) Tokunaga, M.; Larrow, J.F.; Kakiuchi, F.; Jacobsen, E.N. *Science* **1997**, *277*, 936.(2)(a) Jacobsen, E.N. et al. *Tetrahedron Lett.* **1997**, *38*, 773. For a (salen)Cr-catalyzed epoxide ring-opening reaction, see: (b) Martínez, L.E. et al. *J. Am. Chem. Soc.* **1995**, *117*, 5897. Leighton, J.L.; Jacobsen, E.N. *J. Org. Chem.* **1996**, *61*, 389. Larrow, J.F. et al. *J. Am. Chem. Soc.* **1996**, *118*, 7420.

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