

Asymmetric Autocatalysis and the Origin of Homochirality

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Asymmetric autocatalysis is a reaction in which chiral product acts as a chiral catalyst for its own production. Pyrimidyl alkanols work as excellent asymmetric autocatalysts in the enantioselective addition of diisopropylzinc to pyrimidine-5-carbaldehyde with significant amplification of enantioenrichment. Starting from pyrimidyl alkanol with very low enantioenrichment, three consecutive asymmetric autocatalyses afford nearly enantiopure pyrimidyl alkanol with the increase in the amount.

Asymmetric autocatalysis with amplification of ee sheds light on the origin of homochirality of biomolecules. Chiral inorganic crystals, circularly polarized light, chiral crystals formed of achiral organic compounds act as chiral initiators of the asymmetric autocatalysis to afford highly enantioenriched products. Even chiral compounds due to carbon or hydrogen isotopes act as chiral initiators. Spontaneous absolute asymmetric synthesis by the asymmetric autocatalysis has also been achieved. The most recent aspects of asymmetric autocatalysis will be described.