



Johnson Matthey Catalysis and Chiral Technologies

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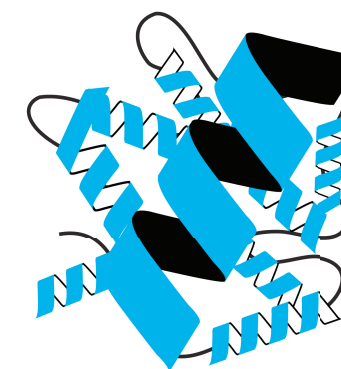
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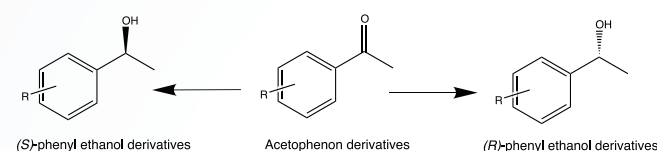
B I O C A T A L Y S T S

JOHNSON MATTHEY CATALYSIS AND CHIRAL TECHNOLOGIES is pleased to offer a continually expanding, novel family of biocatalysts which enhances the chiral capabilities of our chemo-catalyst technology offering. This combined portfolio of catalytic technology allows us to design the most effective synthetic route for our clients.

You now have one reliable resource for your chemo- and biocatalysis needs.

Alcohol Dehydrogenases (ADH)

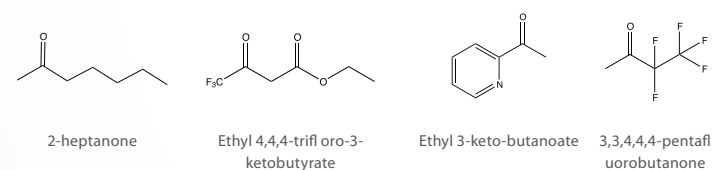
For Biocatalytic Ketone Reduction



Application: Stereoselective reduction of ketones to produce enantiomerically-pure alcohols

- Broad range of ketones reduce with high stereo-selectivity
- Both R and S alcohols can be produced
- Yields often near 100% of theoretical
- Mild conditions; few, if any, side product

Examples of structurally diverse ketones:

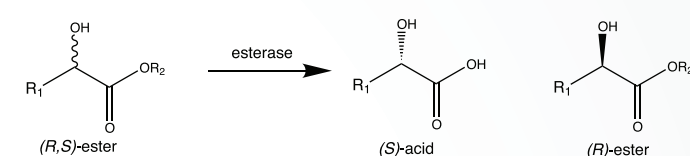


Products include:

- Tens of different commercially available ketoreductases
- Enzymes sold in convenient screening set for rapid identification of the best biocatalyst for a desired reduction.
- All enzymes available on commercial scale

Esterases

For Biocatalytic Resolution of Chiral Acids

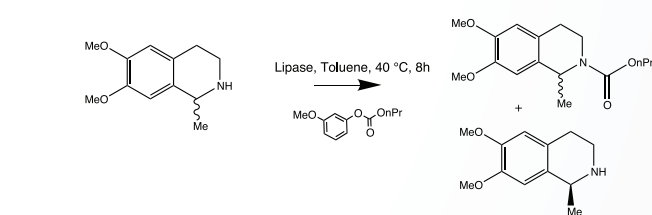


Application:

- Stereoselective hydrolysis of esters
- Stereoselective esterification of carboxylic acids
- Can be carried out in organic solvents or aqueous mixtures
- Mild conditions; tolerant of wide range of functionality

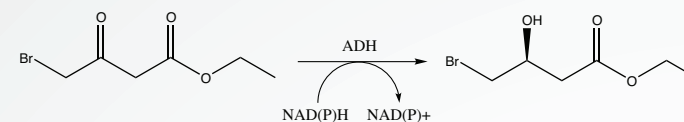
Lipases

For the Production of Enantiomerically Pure Amines and Alcohols

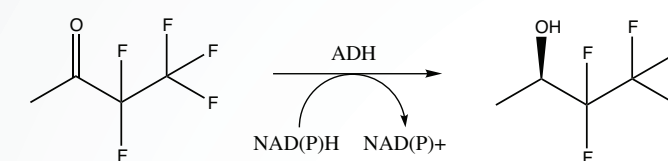


- Stereoselective acylation of amines
- Rapid access to both R and S stereoisomers
- Can be carried out in organic solvents or aqueous mixtures

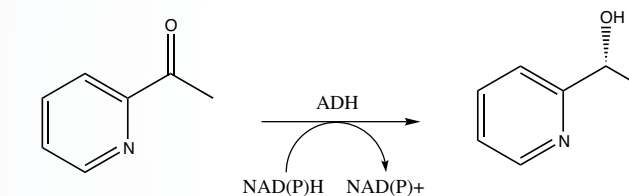
Example Reactions



Asymmetric reduction of ethyl 3-ketobutyrate to ethyl (R)-3-hydroxybutyrate. (S)-specific ADH for the reduction to the opposite enantiomer is also available.



Asymmetric reduction of 3,3,4,4,4-pentafluorobutanone to (R)-pentafluorobutan-2-ol. (S)-specific ADH for the reduction to the opposite enantiomer is also available.



Asymmetric reduction of 2-acetylpyridine to (R)-2-(1-hydroxyethyl)pyridine. (S)-specific ADH for the reduction to the opposite enantiomer is also available.

Range of Enzyme Technology

Enzyme Development

- Enzyme screening kits
- Custom screening of enzymes
- Commercial enzymes

Enzyme Production

- Large scale production of enzymes
- Custom fermentation and fermentation development

Process Development

- Large-scale production of chiral compounds, custom synthesis and technology transfer

Enzyme Classes

Alcohol Dehydrogenase

Application: A broad range of carbonyl compounds (including aldehydes, aliphatic, aromatic, cyclic ketones, diketones, ketoacetals and ketoesters) can be asymmetrically reduced to their corresponding chiral alcohols with high enantioselectivity using these enzymes.

Aldehyde Reductase

Application: NAD(P) dependent dehydrogenation of primary alcohols to the corresponding aldehydes and inverse reaction to give primary alcohols.

Esterases/Lipases

Application: Enantioselective hydrolysis, synthesis and transesterification of esters of primary, secondary and tertiary alcohols. Enantioselective synthesis/hydrolysis of amides.

Transaminases

Application: Asymmetric reductive amination via amino transfer mechanism, for the synthesis of chiral amines.

Ene Reductase

Application: Stereoselective reduction of alkenes.

Aldehyde Dehydrogenase

Application: Aldehyde dehydrogenases catalyse the oxidation of aldehydes to their corresponding carboxylic acids with NAD+NADP+ as cofactor.

Enzymatic system for Cofactor Recycling