

Review

Recent developments in enantioselective cobalt-catalyzed transformations



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Contents

1. Introduction	123
2. Synthesis of chiral acyclic products through enantioselective cobalt-catalyzed transformations	124
2.1. Ring-opening reactions	124
2.2. Michael reactions	129
2.3. Hydrogenation reactions	139
2.4. Hydroboration reactions	141
2.5. Hydrosilylation reactions	143
2.6. Hydrovinylation reactions	146
2.7. Cross-coupling reactions	147
2.8. Henry reactions	148
2.9. Miscellaneous reactions	149
3. Enantioselective cobalt-catalyzed cyclization reactions	153
3.1. Cyclopropanations	153
3.2. Aziridinations and epoxidations	155
3.3. 1,3-Dipolar cycloadditions	156

Abbreviations: Acac, acetylacetonate; Ar, aryl; BDPP, 2,4-bis(diphenylphosphino)pentane; BINAP, 2,2'-bis(diphenylphosphino)-1,1'-binaphthyl; BINOL, 1,1'-bi-2-naphthol; Bn, benzyl; Boc, *tert*-butoxycarbonyl; Bz, benzoyl; Cbz, benzyloxycarbonyl; Cy, cyclohexyl; DCE, 1,2-dichloroethane; de, diastereomeric excess; DIOP, 2,3-O-isopropylidene-2,3-dihydroxy-1,4-bis-(diphenylphosphino)butane; DIPEA, diisopropylethylamine; DMAP, 4-(*N,N'*-dimethylamino)pyridine; DMF, dimethylformamide; DNP, 2,4-dinitrophenolate; Dpen, 1,2-diphenylethylenediamine; (1*R*,1'*R*,2*S*,2'*S*)-DuanPhos, (1*R*,1'*R*,2*S*,2'*S*)-2,2'-di-*tert*-butyl-2,3,2',3'-tetrahydro-1*H*,1'*H*-(1,1')bis(diphenylphosphino)ethane; ee, enantiomeric excess; EWG, electron-withdrawing; Hept, heptyl; Hex, hexyl; DuPhos, 1,2-bis(diphenylphosphino)benzene; MOM, methoxymethyl; MS, molecular sieves; MTBE, methyl *tert*-butyl ether; Naph, naphthyl; Oct, octyl; Pent, pentyl; PG, protecting group; Phth, phthalimido; Pin, pinacolato; PINAP, 4-[2-(diphenylphosphino)-1-naphthalenyl]-*N*-[1-phenylethyl]-1-phthalazinamine; PPN-DNP, bis-triphenylphosphonium 2,4-dinitrophenolate; (*R*)-PROPHOS, (*R*)-(+)-1,2-bis(diphenylphosphino)propane; r.t., room temperature; salen, salicylidenediamine; TADDOL, $\alpha,\alpha,\alpha',\alpha'$ -tetraaryl-1,3-dioxolan-4,5-dimethanol; TBAF, tetra-*n*-butylammonium fluoride; TBS, *tert*-butyldimethylsilyl; TEA, triethylamine; Tf, trifluoromethanesulfonyl; THF, tetrahydrofuran; TIPS, triisopropylsilyl; TMS, trimethylsilyl; Tol, tolyl; TPS, triphenylsilyl; Ts, 4-toluenesulfonyl (tosyl).

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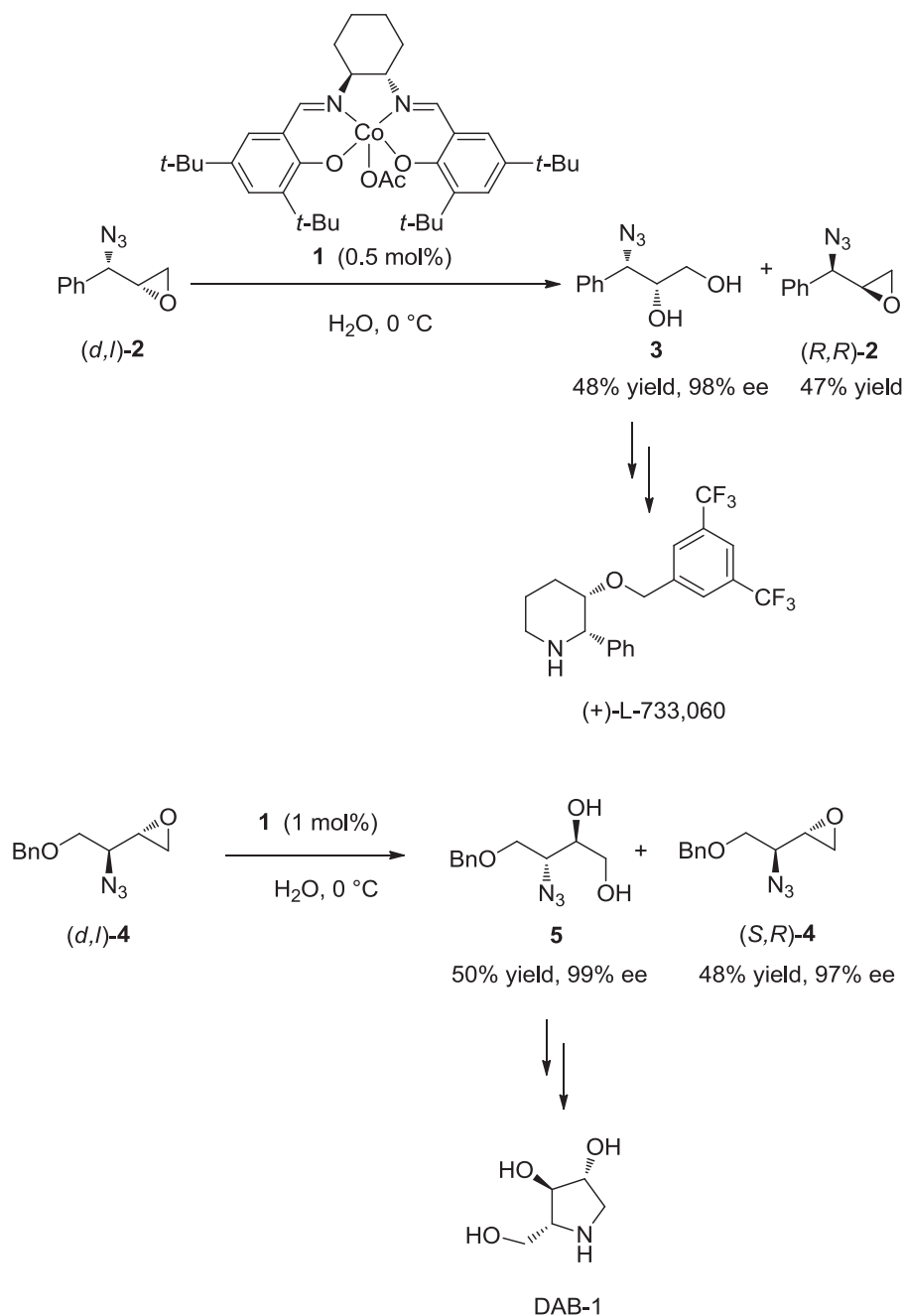
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3.4.	[2+2+2] Cycloadditions	156
3.5.	Hydroacylations	159
3.6.	Radical cyclizations	160
3.7.	Miscellaneous cyclizations	163
4.	Conclusions	165
	References	166

1. Introduction

The catalysis of organic reactions by metals still represents one of the most powerful tools in organic synthesis [1], with a special

mention for asymmetric transition-metal catalysis allowing highly enantioselective reactions to be performed. Efforts to develop novel asymmetric transformations have focused for a long time on the use of metals, including palladium, rhodium, copper, irid-



Scheme 1. Hydrolytic kinetic resolutions of azido epoxides catalyzed with a salen cobalt complex and total syntheses of (+)-L-733,060 and DAB-1 [15,16].

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