

SYNTHESIS ALERTS

Synthesis Alerts is a monthly feature to help readers of Synthesis keep abreast of new reagents, catalysts, ligands, chiral auxiliaries, and protecting groups which have appeared in the recent literature. Emphasis is placed on new developments but established reagents, catalysts etc are also covered if they are used in novel and useful reactions. In each abstract, a specific example of a transformation is given in a concise format designed to aid visual retrieval of information.

Synthesis Alerts is a personal selection by Paul Blakemore, Stephen Brand, John Christopher, Emma Guthrie, Philip Kocienski, Louise Lea, Graham McAllister, Russell McDonald and Robert Narquian of Glasgow University. The journals regularly covered by the abstractors are: Angewandte Chemie International Edition, Bulletin of the Chemical Society of Japan, Chemistry A European Journal, Chemistry Letters, European Journal of Organic Chemistry, Helvetica Chimica Acta, Heterocycles, Journal of Organic Chemistry, Journal of the American Chemical Society, Organometallics, Synlett, Synthesis, Tetrahedron, Tetrahedron Asymmetry and Tetrahedron Letters.

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(S)-N-(Dimethylphosphoryl)- α,α-diphenylpyrrolidine-2-methanol			Catalyst
The title phosphinamide catalyses the asymmetric reduction of ketones by borane.	 A	 81%, er = 96:4	
B. Burns, N. P. King, H. Tye, J. R. Studley, M. Gamble, M. Wills <i>J. Chem. Soc., Perkin Trans 1</i> 1998 , 1027.			2 examples (yields 81 and 90%, %ee 92 and 62%).
Tetraphenylphosphonium Chloride			Catalyst
The combination of a Pd(II) catalyst and A in the presence of small amounts of <i>N,N</i> -dimethylglycine (DMG) currently represents the most active and selective catalyst system for Heck reactions of normally unreactive halides.	 A	 6 examples (conversion 66-97%).	98% conversion (1:2:3 = 98:<1:2), only 1% of undesired scrambling products
M. T. Reetz, G. Lohmer, R. Schwickardi <i>Angew. Chem. Int. Ed. Engl.</i> 1998 , 37, 481.			NMP = <i>N</i> -methylpyrrolidinone Ar = <i>p</i> -benzaldehyde
Water-Soluble Ruthenium Metathesis Catalyst			Catalyst
The title reagent, in the presence of a Brønsted acid, catalyses living ring opening metathesis polymerisation (ROMP) in aqueous media.	 A R = cyclohexyl		The presence of acid not only serves to remove small concentrations of hydroxide ions (which cause significant catalyst decomposition), but also accelerates polymerisation and yields a true living system.
D. M. Lynn, B. Mohr, R. H. Grubbs <i>J. Am. Chem. Soc.</i> 1998 , 120, 1627.			

1,2-Bis(tert-butylmethylphosphino)ethane Rhodium(I) Norbornadiene Complex			Catalyst
The synthesis of a new class of P-chiral phosphine ligands and their application to the rhodium(I) catalysed asymmetric hydrogenation of α -(acylamino)- arylates is described.	 A	 er = 92:8 (yield not specified)	
T. Imamoto, J. Watanabe, Y. Wada, H. Masuda, H. Yamada, H. Tsuruta, S. Matsukawa, K. Yamaguchi <i>J. Am. Chem. Soc.</i> 1998 , <i>120</i> , 1635.			10 examples employing A (%ee 55-99.9%); 11 other examples employing analogous catalysts.
(Dibenzylideneacetone)palladium(0)			Catalyst
The title reagent in the presence of (<i>S</i>)-BINAP catalyses the enantioselective arylation of ketone enolates to afford quaternary stereogenic centres.	Pd₂(dba)₃ A	 9 examples (yields 61-88%, %ee 40-98%). Pd(OAc) ₂ was also used as an alternative source of palladium. 86%, er = 98:2	
J. Åhman, J. P. Wolfe, M. V. Troutman, M. Palucki, S. L. Buchwald <i>J. Am. Chem. Soc.</i> 1998 , <i>120</i> , 1918.			
Tungsten Pentacarbonyl Tetrahydrofuran Complex			Catalyst
The title reagent catalyses the <i>endo-dig</i> cyclisation of ω -acetylenic silyl enol ethers.	W(CO)₅•THF A	 6 examples (yields 73-93%). The process is only successful for terminal acetylenes.	
K. Maeyama, N. Iwasawa <i>J. Am. Chem. Soc.</i> 1998 , <i>120</i> , 1928.			
Tris(triphenylphosphine)rhodium(I) Chloride			Catalyst
The title reagent catalyses the intramolecular [5+2] cycloaddition of alkenes to tethered vinyl cyclopropanes.	RhCl(PPh₃)₃ A	 6 examples (yields 77-94%). All substrates possessing a 3-carbon tether between olefins yielded <i>cis</i> 5,7-ring systems, those with a 4-carbon tether yielded <i>trans</i> 6,7-ring systems.	
P. A. Wender, C. O. Husfeld, E. Langkopf, J. A. Love <i>J. Am. Chem. Soc.</i> 1998 , <i>120</i> , 1940.			

(R)-3,3'-Bis(2'',5''-dihexyloxyphenyl)-1,1'-binaphthol			Catalyst
A catalyses the enantioselective addition of diethylzinc to aldehydes.			
W.-S. Huang, Q.-S. Hu, L. Pu <i>J. Org. Chem.</i> 1998 , <i>63</i> , 1364.			
(4<i>R</i>,5<i>R</i>)-2,2-Dimethyl-$\alpha,\alpha,\alpha',\alpha'$-tetraphenyl-1,3-dioxolane-4,5-dimethanol [(<i>R,R</i>)-TADDOL]			Catalyst
A catalyses the C-alkylation of aldimine Schiff's bases of alanine esters under phase-transfer conditions.			
Y. N. Belokon, K. A. Kochetkov, T. D. Churkina, N. S. Ikonnikov, A. A. Chesnokov, O. V. Larionov, V. S. Parmár, R. Kumar, H. B. Kagan <i>Tetrahedron: Asymmetry</i> 1998 , <i>9</i> , 851.			
N-Anthracynlmethyl Cinchoninium Hydroxide			Catalyst
The title catalyst mediates the enantioselective epoxidation of α,β -unsaturated ketones under phase transfer conditions.			
B. Lygo, P. G. Wainright <i>Tetrahedron Lett.</i> 1998 , <i>39</i> , 1599.			
Homochiral Oxazaborolidine			Catalyst
The title catalyst mediates the enantioselective reduction of an α -bromo ketone with BH_3 .			
R. Hett, C. H. Senanayake, S. A. Wald <i>Tetrahedron Lett.</i> 1998 , <i>39</i> , 1705.			
(3<i>S</i>)-<i>N,N</i>'-Bis(<i>p</i>-methoxybenzyl)-3-isopropylpiperazine-2,5-dione			Chiral Auxiliary
Chiral auxiliary A employs a chiral relay network for the synthesis of enantiomerically pure α -amino acids. Non-stereogenic <i>N</i> -benzyl protecting groups enhance diastereocontrol during enolate alkylation.			
S. D. Bull, S. G. Davies, S. W. Epstein, J. V. A. Ouzman <i>Chem. Commun.</i> 1998 , 659.	6 examples of the alkylation of A (yields 63-90%, %de 89-98%).		

Pseudoephedrine		Chiral Auxillary
The title chiral auxillary mediates the diastereoselective alkylation of its α -fluoroacetamide derivatives.		
A. G. Myers, L. McKinstry, J. K. Barbay, J. L. Gleason <i>Tetrahedron Lett.</i> 1998 , <i>39</i> , 1335.		
(1<i>S</i>,2<i>S</i>)-1,2-Dimethoxy-1,2-diphenylethane		Ligand
An asymmetric Horner-Wadsworth-Emmons reaction mediated by ligand A is described.		
M. Mizuno, K. Fujii, K. Tomioka <i>Angew. Chem. Int. Ed. Engl.</i> 1998 , <i>37</i> , 515.		
Bis[(<i>R</i>)-dihydro-5-isopropylloxazolylphenyl]oxalamide		Ligand
Enantioselective epoxidation catalysed by ruthenium complexes with ligand A is reported. The catalyst is treated with NaIO4 oxidant prior to addition of the substrate in order to minimise production of benzaldehyde and improve ee.		
N. End, A. Pfaltz <i>Chem. Commun.</i> 1998 , 589.		
(--)(1<i>S</i>,2<i>S</i>)-Bis[(diphenylphosphino)benzamido]cyclohexane		Ligand
A palladium catalyst derived from the title ligand effected the asymmetric alkylation of a meso allylic dibenzoate by (phenylsulfonyl)-nitromethane. The resultant product was utilised in a total synthesis of (+)-valienamine.		
B. M. Trost, L. S. Chupak, T. Lübbbers <i>J. Am. Chem. Soc.</i> 1998 , <i>120</i> , 1732.		
Dihydroquinidine- p-chlorobenzoate [(DHQD)2-CLB]		Ligand
Osmium tetroxide and the title ligand catalyse the asymmetric aminohydroxylation of silyl enol ethers.		
P. Phukan, A. Sudalai <i>Tetrahedron: Asymmetry</i> 1998 , <i>9</i> , 1001.		

(S)(+)-2-[2-(Diphenylphosphino)phenyl]-4-(benzyl)oxazoline [(S)-bn-phox]			Ligand
The asymmetric aza-Claisen rearrangement of allyl imides catalysed by homochiral palladium(II) complexes is reported. Y. Uozumi, K. Kato, T. Hayashi <i>Tetrahedron: Asymmetry</i> 1998 , <i>9</i> , 1065.			30%, er = 91:9 37% 4 examples (yields 30-88%, %ee 28-81%).
10-N-[(Naphthylmethyl)sulfonyl]borneol			Ligand
The title compound mediates the enantioselective alkylation of ketones with diethyl- and dimethyl-zinc. D. J. Ramón, M. Yus <i>Tetrahedron Lett.</i> 1998 , <i>39</i> , 1239.			89%, er = 95:5 14 examples (yields 3-95%, %ee 0, 34-86%) are described
2,4-Dinitrobenzenesulfonamide			Protecting Group
The 2,4-dinitrobenzenesulfonamide protecting group for amines can be removed with thioacids to give the corresponding amide. T. Messeri, D. D. Sternbach, N. C. O. Tomkinson <i>Tetrahedron Lett.</i> 1998 , <i>39</i> , 1669.			R1 = p-methoxybenzyl R2 = CH2CH=CH2 8 examples (yields 81-96%) are described.
Titanium Isopropoxide			Reagent
A new titanium reagent A prepared from the reaction of titanium isopropoxide with lithium in the presence of TMSCl, is utilised in the synthesis of heterocycles with dry air or pure nitrogen as the nitrogen source. M. Mori, K. Hori, M. Akashi, M. Hori, Y. Sato, M. Nishida <i>Angew. Chem. Int. Ed. Engl.</i> 1998 , <i>37</i> , 636.			5 examples (yields 37-72% in dry air, 51-90% in pure nitrogen). The methodology is applied to a formal total synthesis of (+)-lycopodine. Preparation of A is described.
2-Trimethylsilyl-1,3-dioxolane			Reagent
A new method is described for the generation of hydroxymethyl anion equivalents by photo-induced electron transfer catalysis (PET catalysis) starting from α-silyl ethers. G. Gutenberger, E. Steckhan, S. Blechert <i>Angew. Chem. Int. Ed. Engl.</i> 1998 , <i>37</i> , 660.		 10 examples of photoinduced radical additions of α-silyl ethers to electron poor alkenes (yields 15-64%, %de 28-72%). ADC = 9,10-Anthracedicarbonitrile	15%, dr = 86:14 (50%, dr = 1.9:1)

<i>o</i>-Diphenylphosphanylbenzoic Acid			Reagent
<p><i>ortho</i>-Diphenylphosphanylbenzoyl esters direct diastereoselective addition of Gilman cuprates to α,β-unsaturated enoates.</p>	<p>A</p>		<p>Bu₂CuLi (1.5 eq) Et₂O -78°C → 0°C, 2.5 h</p> <p>68%, dr = 95% 7 examples (yields 60-93%, %de 60-90%).</p>
<p>B. Breit <i>Angew. Chem. Int. Ed. Engl.</i> 1998, <i>37</i>, 525.</p>			
Cerium(IV) Ammonium Nitrate			Reagent
<p>A novel tandem [3 + 2]-type cycloaddition using a CAN-mediated ring-opening reaction of cyclopropylamines is reported. The previously unreported accelerative effect of the <i>N</i>-benzyl group for oxidative ring opening is also described.</p>	<p>A</p>		<p>Ce(NH₄)₂(NO₃)₆ A, NaHCO₃ MeOH-THF (5:1), rt</p> <p>60%, dr = 1:1 6 examples (yields 42-77%).</p>
<p>Y. Takemoto, S. Yamagata, S. Furuse, H. Hayase, T. Echigo, C. Iwata <i>Chem. Commun.</i> 1998, 651.</p>			
Dimethylphenylsilyllithium			Reagent
<p>A reacts with tertiary amides to give enediamines, which can be isolated in good yield when the α-carbon is branched. The enediamines can be hydrolysed to α-amino ketones.</p>	<p>A</p>		<p>Ph(H₂C)₂CONMe₂ A (1.1 eq), THF -78°C → -20°C, 1 h</p> <p>12 examples of the synthesis of α-amino ketones (yields 6-92%). Various reactions of enediamines are also reported.</p>
<p>I. Fleming, U. Ghosh, S. R. Mack, B. P. Clark <i>Chem. Commun.</i> 1998, 711.</p>			
Dichloro(2,2,2-trifluoroethoxy)oxovanadium(V)			Reagent
<p>The title reagent promotes the one-electron oxidative cyclisation of silyl enol ethers onto allyl silanes. The unsymmetrical coupling of silyl enol ethers can also be achieved employing the title reagent.</p>	<p>A</p>		<p>Ph(MeO)₂SiCH=CH₂ A (2 eq) CH₂Cl₂, -78°C, 40 min 73%</p> <p>5 examples of oxidative cyclisation (yields 71-83%).</p>
<p>K. Ryter, T. Livinghouse <i>J. Am. Chem. Soc.</i> 1998, <i>120</i>, 2658.</p>			
1,1-Bis(tributylstannyli)-3-[(methoxymethyl)oxy]propane			Reagent
<p>A novel method of three-carbon elongation using the title reagent is reported.</p>	<p>A</p>		<p>(a) BuLi (2 eq), HMPA (2 eq) THF, -78°C, 30 min (b) PhCHO (3 eq) 0°C, 2 h</p> <p>80%, E:Z = 35:1</p>
<p>N. Isono, M. Mori <i>J. Org. Chem.</i> 1998, <i>63</i>, 1773</p>			

Scandium Triflate		Reagent
Esterification of the hindered tertiary alcohol 20-(S)-camptothecin is performed using the title reagent in combination with DMAP.	$\text{Sc}(\text{OTf})_3$ A	<p>5 examples (yields 89-96%) including three using <i>N</i>-hydroxy succinimide esters without DIPC. Epimerisation was minimal (<2%) in all cases.</p>
R. B. Greenwald, A. Pendri, H. Zhao <i>Tetrahedron: Asymmetry</i> 1998 , <i>9</i> , 915.		
Di-(<i>1R,2S</i>)-2-phenyl-1-cyclohexyl Diazenedicarboxylate		Reagent
Asymmetric azo-ene reactions using the title reagent are described.		<p>5 examples (yields 57-92%, %de 72-94%)</p>
M. A. Brimble, C. K. Y. Lee <i>Tetrahedron: Asymmetry</i> 1998 , <i>9</i> , 873.		
Diphenyl Cyanomethylenephosphonate		Reagent
The title reagent effects the synthesis of <i>cis</i> -1-alkenenitriles from aldehydes.	CH_3CN ↓ (a) LDA (b) $(\text{PhO})_2\text{P}(\text{O})\text{Cl}$ (c) HCl A	<p>7 examples (yields 68-100%, Z:E 64:6-100:0) are described.</p>
T. Y. Zhang, J. C. O'Toole, J. M. Dunigan <i>Tetrahedron Lett.</i> 1998 , <i>39</i> , 1461.		
N-(4-Methoxybenzyl)- <i>o</i>-benzenedisulfonimide		Reagent
The title reagent mediates the conversion of alcohols and phenols to the corresponding 4-methoxybenzyl (PMB) ethers.		<p>3 examples (yields 57-78%) are described. Treatment of A with aqueous KOH in DMF yields 4-methoxy benzyl alcohol thus constituting a mild procedure for deaminating amines.</p>
P. H. J. Carlsen <i>Tetrahedron Lett.</i> 1998 , <i>39</i> , 1799.		
Samarium Diiodide / Iodoform		Reagent
The title reagent pair mediates the diiodomethylation of aldehydes and ketones.	SmI_2 A CHI_3 B	<p>15 examples (yields 0, 23-61%) are described. Transformation of the α-diiodoalcohols to the corresponding α-hydroxy acids and α-iodoaldehydes is also reported.</p>
J. M. Concellón, P. L. Bernad, J. A. Pérez-Andrés <i>Tetrahedron Lett.</i> 1998 , <i>39</i> , 1409.		