**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:
Robert Chow, John Christopher, Emma Guthrie, Philip Kocienski, Alexander Kuhl, Louise Lea, Russell McDonald, Graeme McAllister and Robert Narquizian of Glasgow University.

Georg Thieme Verlag does not accept responsibility for the accuracy, content, or selection of the data.

The journals regularly covered by the abstractors are:
- Angewandte Chemie International Edition
- Bulletin of the Chemical Society of Japan
- Chemical Communications
- Chemistry A European Journal
- Chemistry Letters
- Collection Czechoslovak Chemical Communications
- European Journal of Organic Chemistry
- Helvetica Chimica Acta
- Heterocycles
- Journal of the American Chemical Society
- Journal of Organic Chemistry
- Organometallics
- Perkin Transactions 1
- Synlett
- Synthesis
- Tetrahedron
- Tetrahedron Asymmetry and Tetrahedron Letters

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### Copper([(S,S)-phenylbis(oxazoliny]pyridine)dihexafluoroantimionate]

<table>
<thead>
<tr>
<th>Catalyst</th>
</tr>
</thead>
<tbody>
<tr>
<td>A mediates Mukaiyama aldol reactions between benzylisoxazolidine and a range of silylated acetals.</td>
</tr>
</tbody>
</table>

![Copper catalyst structure](image)


12 examples (yields 11-90%, diastereofacial selectivity ≥74:26, δee ≥63%).

### Copper([(S,S)-tert-butylbis(oxazoliny]propane)dihexafluoroantimionate]

<table>
<thead>
<tr>
<th>Catalyst</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bisoxazolinedione A catalyses the aldol addition of a variety of enolilanes to pyruvic esters.</td>
</tr>
</tbody>
</table>

![Copper catalyst structure](image)


24 examples (yields 53-97%, diastereofacial selectivity ≥90:10, δee ≥22).

### Dichlorotriclohexyrophosphino-(2-iso-propoxy)benzylidene ruthenium(II)

<table>
<thead>
<tr>
<th>Catalyst</th>
</tr>
</thead>
<tbody>
<tr>
<td>The use of A as a recyclable ring closing methathesis catalyst is described.</td>
</tr>
</tbody>
</table>

![Dichlorotriclohexyrophosphino catalyst structure](image)


9 examples (yields 67-99%).

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Synthesis 1999, No. 6, 1076–1083 ISSN 0039-7881 © Thieme Stuttgart · New York
### (R)-2.2'-Binaphthyl-Silver Triflate Complex

A catalysts the enantioselective aldo addition of trialkyltin enol ethers with benzaldehyde. The required enol ethers are prepared *in situ* from the corresponding enol trichloroacetate.

![Catalyst](image)


3 examples (yields 59-94%, 78:22 ≤ anti:syn ≤ 92:8, %ee<sub>anti</sub> = 84-93%) are reported.

### Lithium Perchlorate

The title reagent is used together with 1,4-diazabicyclo[2.2.2]octane (DABCO) to catalyze the coupling of α,β-unsaturated carboxylic acid compounds with aldehydes in the Baylis-Hillman reaction.

![Catalyst](image)


12 examples (yields 35-85%) are reported.

### Bis(acetoacetonato)nickel(II)

Et<sub>2</sub>ZnA and Et<sub>2</sub>B/A catalysts promote the homooligation of carboxyl compounds. Both catalytic systems isoprene reacts with aldehydes to provide 1,3-anti-isomers with excellent selectivity.

![Catalyst](image)


16 examples (yields 0, 10-90%, 1:5 ≤ anti:syn ≤ 20:1).

### [1,1'-Bis(diphenylphosphino)ferrocene]dichloropalladium

A catalysts the synthesis of enantioenriched homopropargylic alcohols via addition to aldehydes of transient chiral allenylidium reagents derived from enantioenriched homopropargylic mesylates.

![Catalyst](image)


6 examples (yields 62-88%, 45:55 ≤ anti:syn ≤ 95:5, %ee<sub>anti</sub> = 92-96%).

### (S,S)-2.2''-Bis(diethylphosphino)methyl]-1,1''-biferrocene

The optically active diphosphine A is utilized in the medium-catalyzed asymmetric hydroxymethylation of ketones.

![Ligand](image)


8 examples (yields 82-99%, %ee 77-94%).
[(R)-α-(2-Naphthylaminomethyl)]ferrocene

A novel copper(i) catalysed substitution of unsymmetrical allyl chlorides with diorganozinc compounds utilising A is reported.

**Ligand**

\[
\begin{align*}
\text{Fe} & \quad \text{2-naphthyl} \\
\text{A} & \\
\end{align*}
\]


11 examples (yields 45-72%, 90:10 ≤ S<sub>θ</sub>:S<sub>α</sub>2 ≤ 99:1, %ee = 37-87%).

(R,S,R,S)-P,P'-1,2-Phenylenebis(endo-2,5-dimethyl-7-phosphabicyclo[2.2.1]heptane)

A highly enantioselective hydrogenation of enol acetates catalysed by a Rh(II)-ligand A complex is reported.

**Ligand**

\[
\begin{align*}
\text{Me} & \quad \text{Me} \\
\text{P} & \quad \text{P} \\
\text{Me} & \quad \text{Me} \\
\text{A} & \\
\end{align*}
\]


13 examples (conversions 100%, %ee = 66-99%).

(αR,αR)-2,2′-Bis-(α-Ν,N′-dimethylaminobenzyl)-(S,S)-1,1′-bis(diphenylphosphino)ferrocene

The use of a series of C₂-symmetric diamino FERRI/PHOS ligands, including the title compound, in the enantioselective preparation of chiral α-amino acids is described.

**Ligand**

\[
\begin{align*}
\text{Me}_2\text{N} & \quad \text{Me}_2\text{N} \\
\text{P} & \quad \text{P} \\
\text{A} & \\
\end{align*}
\]


11 examples (%ee = 95-99%) are reported.

Propargyl Chloroformate

The title reagent is used to introduce the propargyloxycarbonyl (Prox) group for the novel protection of amino and hydroxy functions. Similarly, protection of carboxy functions as the propargyl ester is reported.

**Protecting Group**

\[
\begin{align*}
\text{COCl} & \quad \text{O} \\
\text{Cl} & \quad \text{O} \\
\text{A} & \\
\end{align*}
\]


3 examples of protection (yields 100%) and 2 examples of cleavage (yields 88-100%) are reported.

Zirconium Tetrachloride

Zirconium tetrachloride catalyses the in-situ transacetalisation of carbonyl compounds under mild conditions. The reaction is selective for aldehydes in the presence of ketones but the selectivity diminishes when the ketone is cyclic. Thus competition experiments show that benzaldehyde and cyclohexanone give nearly a 1:1 mixture of 1,3-dioxanes. The method can also be used for the formation of thioacetics.

**Protecting Group**

\[
\begin{align*}
\text{ZrCl}_4 & \\
\text{Z} & \\
\end{align*}
\]


20 examples. In the absence of the diol, the diethyl acetal is formed instead.
### Iodine Monobromide

<table>
<thead>
<tr>
<th>Protecting Group</th>
<th>Reaction Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-Br</td>
<td><img src="image" alt="Reaction Scheme" /></td>
</tr>
</tbody>
</table>

K. P. Ravindranathan Kartha and R. A. Field<br>
*Synlett, 1999, 311.*

8 non-trivial examples; yields 80-96%.

### Iron(III) Chloride

<table>
<thead>
<tr>
<th>Reagent</th>
<th>Reaction Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>FeCl₃</td>
<td><img src="image" alt="Reaction Scheme" /></td>
</tr>
</tbody>
</table>

Y. Wang, A. M. Arif, F. G. West<br>

4 examples (yields 53-75%).

### Palladium(II) Chloride / Copper(II) Chloride

<table>
<thead>
<tr>
<th>Reagent</th>
<th>Reaction Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>PdCl₂, CuCl₂</td>
<td><img src="image" alt="Reaction Scheme" /></td>
</tr>
</tbody>
</table>

J. D. White, J. Hong, L. A. Robarge<br>

5 examples (yields 0, 20-61%) are reported.

### Silver Tetrafluoroborate

<table>
<thead>
<tr>
<th>Reagent</th>
<th>Reaction Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgBF₄</td>
<td><img src="image" alt="Reaction Scheme" /></td>
</tr>
</tbody>
</table>

H. Grundberg, M. Andergran, U. J. Nilsson<br>

10 examples (yields 5-100%).

### Magnesium

<table>
<thead>
<tr>
<th>Reagent</th>
<th>Reaction Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mg</td>
<td><img src="image" alt="Reaction Scheme" /></td>
</tr>
</tbody>
</table>

Y. Ishino, Y. Kita, H. Maekawa, T. Ohno, Y. Yamashita, I. Nishiguchi<br>

11 examples (yields 15-100%, 60:40 < E:Z < 2:98).
**Cerium Ammonium Nitrate**

The title reagent effects the rapid deprotection of cyclic ketals and acetals. A wide variety of functional and protecting groups are tolerated and the method is suitable for acid-labile substrates.

\[
\text{(NH}_2\text{)}_2\text{Ce(NO}_3\text{)}_6
\]

\[\text{A} \xrightarrow{\text{CH}_2\text{CN-H}_2\text{O, 70}^\circ\text{C, 2 min}} \text{B (2.5 eq)} \xrightarrow{98\%} \]

10 examples (yields 6-98%).


**Diethoxymethyltributylstannane**

Reaction of A with olefinic alcohols in the presence of acid results in facile transacetalisation followed by intramolecular cyclopropanation.

\[
\text{Bu}_3\text{SnCH(OEt)}_2
\]

\[\text{A} \xrightarrow{\text{C}_2\text{H}_5\text{SiCH(OEt)}_2} \text{OH} \xrightarrow{\text{A} (1.1 \text{ eq}). \text{TMSOTf (1.1 eq}) \xrightarrow{\text{CH}_2\text{Cl}_2, \text{rt, 30 min}} \text{C}_2\text{H}_5\text{SiCH(OEt)}_2 \text{OH} \xrightarrow{63\%, \text{ er} >99.1} \]

9 examples (yields 43-93%, %see 84-99%).


**p-Toluenesulfonyl Chloride / Triethylamine / Trimethylamine Hydrochloride**

The sulfonylation of a range of alcohols has been achieved using the title reagent combination. The system represents an alternative to the traditional use of pyridine, and the problematic chloride forming side-reaction is circumvented.

\[
\text{TsCl}
\]

\[\text{A} \xrightarrow{T\text{S}2\text{N}} \text{B} \xrightarrow{\text{C} \text{(10 mol%}}} \text{C}_2\text{H}_5\text{HCl}
\]

49 examples (yields 28-98%).


**2-Chloro-4-(p-nitrophenacyl)pyridinium Bromide**

Reaction of the title reagent with aliphatic secondary amines provides a one-pot route to 1-amino-4-(5-aryloxazol-2-yl)bïuta-1,3-dienes.

\[
\text{A}
\]

\[\text{B} \xrightarrow{\text{piperidine (4 eq)}} \text{MeCN, 3 h} \text{97%} \]

5 examples (yields 83-97%). A clear predominance of the (1E,3E) isomer (85-90%) over the (1E,3Z) isomer is observed.


**Diacetoxybenzene / Trimethylsilyl Azide**

The title reagent pair promotes the allylic oxidation of O-silylated glycosidic reactions with the reported system proceed in higher yield than with the traditional Phl(OH)OTs reagent. Use of this complex in the allylic O-benzyl deblocking of glycosals is also discussed.

\[
\text{Phi(OAc)}_2
\]

\[\text{A} \xrightarrow{T\text{MSN}_3} \text{B} \xrightarrow{\text{CH}_2\text{Cl}_2, -5^\circ\text{C} \rightarrow \text{rt, 1 h}} \text{C}_2\text{H}_5\text{Br} \xrightarrow{95\%} \]

6 examples (yields 43-95%).

### (-)-Sparteine

A new and enantioselective indolizidine synthesis by meso-epoxide \( \alpha \)-deprotonation and transannular N-C insertion in the presence of chiral base A is reported.

![Chemical structure](image1)


### (-)-Sparteine

Sparteine-mediated chiral induction by an elimination-coupled lithium-ene reaction in the synthesis of \( \pm \)-(3R,4R)-1,2-dihydromultifidene is reported.

![Chemical structure](image2)


### (-)-Sparteine

Asymmetric syntheses of N-Boc 2-substituted pyrrolidines and piperidines by intramolecular cyclization in the presence of A are reported.

![Chemical structure](image3)

C. Serino, N. Stehle, Y. S. Park, S. Florio, P. Beak J. Org. Chem. 1999, 64, 1160. 8 examples (yields 29-93%, \%ee = 30-94%).

### Isopropylmagnesium Bromide

Using A or \( \text{Pr}_2\text{Mg} \), highly functionalised alkylmagnesium halides can be prepared at low temperature via an iodine-magnesium exchange with retention of configuration of the double bond. Under these conditions functional groups such as cyanide, carbonate or ethyl ester are tolerated.

![Chemical structure](image4)

M. Rottländer, L. Boymond, G. Cahiez, P. Knochel J. Org. Chem. 1999, 64, 1080. 11 examples (yields 60-95%).

### 1-Thiobenzoyl-6-nitrobenzotriazole

Thioacetyl nitrobenzotriazoles including A are utilised in an efficient synthesis of thioesters.

![Chemical structure](image5)

M. A. Shalaby, H. Rapoport J. Org. Chem. 1999, 64, 1065. 14 examples using 8 different thioacetyl nitrobenzotriazoles (yields 53-89%).

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**Synthesis 1999, No. 6, 1076–1083  ISSN 0039-7881 © Thieme Stuttgart · New York**
1,3-bis-Boc-2-methyl-2-thiopseudourea

A synthetic route towards disubstituted guanidines is described. A series of primary and secondary alcohols were guanylated under Mitsunobu conditions and subsequent reaction with amines affords disubstituted guanidines.

Reagent

\[
\begin{align*}
\text{BocHN} & \longrightarrow \text{N} \quad \text{N} \quad \text{BocHN} \\
\text{SMe} & \quad \text{SMe}
\end{align*}
\]


10 examples (yields 32-100%) are reported.

B-Chlorodiisopinocampheylborane

The title reagent is used in the enantioselective synthesis of β-hydroxy carboxylic acids.

Reagent

\[
\begin{align*}
\text{CH}_3 & \quad \text{BCl} \\
\text{B} & \quad \text{A}
\end{align*}
\]


8 examples (yields 87-92%, %ee = 91-99%).

Quinuclidine N-oxide

The use of A as a replacement for HMPA in a range of reactions is reported.

Reagent

\[
\begin{align*}
\text{O}_2\text{N} & \quad \text{O} \\
\text{OMe} & \quad \text{A}
\end{align*}
\]


4 examples (yields 78-90%) are described.

3-Tert-butyl-2,2-dimethylhex-5-en-3-ol

A novel fragmentation-allylation reaction of A generates an allylic zinc reagent in situ, which reacts with a range of electrophiles.

Reagent

\[
\begin{align*}
\text{t-Bu} & \quad \text{I} \\
\text{Ph} & \quad \text{A}
\end{align*}
\]


12 reactions with aldehydes, ketones and imines (yields 63-99%). Similar reactions of γ-substituted homoallylic alcohols are also reported.

Polymethylhydroxiloxane (PHMS) / Potassium Fluoride

The title reagent pair catalyses the in situ generation of tributyltin hydride from tributyltin chloride. The technique can be applied to reactions catalytic in tin.

Reagent

\[
\begin{align*}
\text{TMSO(Me)HSiO}_2\text{TMS} & \quad \text{A} \\
\text{KF} & \quad \text{B}
\end{align*}
\]


10 examples (yields 21-96%) of a variety of tin-mediated reactions are reported.
**Bis(acetylacetonato)cobalt(II) / Diisobutylaluminium Hydride**

The title reagents are used in the selective 1,4-reduction of \( \alpha,\beta \)-unsaturated carbonyl compounds.

<table>
<thead>
<tr>
<th>A</th>
<th>A (1.5 eq)</th>
<th>B (1.5 eq)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co(acac)_2</td>
<td>( \text{THF, } -78^\circ\text{C} \rightarrow \text{rt, } 2 \text{ h} )</td>
<td>96%</td>
</tr>
<tr>
<td>DIBAL</td>
<td></td>
<td>15 examples (yields 60-100%).</td>
</tr>
</tbody>
</table>


**Tetrahydroammonium Fluoride**

Palladium-catalysed cross-coupling reactions between organostannanes and organic halides facilitated by A are reported. All four substituents on tin can take part in carbon-carbon bond formation.

<table>
<thead>
<tr>
<th>A</th>
<th>((\rho-\text{ Tol})_2\text{Sn} (25 \text{ mol}) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bu$_4$NF</td>
<td>((\rho-\text{ Tol})_2\text{Sn} )</td>
</tr>
<tr>
<td>( \text{A (6 eq), Pd(dba)$_2$ (0.8 mol}) \</td>
<td></td>
</tr>
<tr>
<td>PP$_3$ (3.2 mol)</td>
<td>Dioxane, ( \Delta ), 1 d</td>
</tr>
<tr>
<td>96%</td>
<td></td>
</tr>
</tbody>
</table>


5 examples (yields 0, 27-95%).

**\( N \)-(Trifluoroacetyl)succimide**

The trifluoroacetylation of alcohols, phenols and amines is conveniently achieved using A.

<table>
<thead>
<tr>
<th>A</th>
<th>A (1.6 eq)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{N,O-CF}_3 )</td>
<td>PhMe, ( \Delta ), 10 h</td>
</tr>
<tr>
<td>96%</td>
<td></td>
</tr>
</tbody>
</table>


14 examples (yields 83-99%) are described.

**Dimethyl Sulfoxide**

Reaction of \((2\text{- bromoalk-1-enyl)boranes with DMSO results in 1,2-migration of an alkyl group from the boron to the } \alpha\text{- carbon without elimination of bromine to give internal (E)-alkenyl bromides.} |

<table>
<thead>
<tr>
<th>Me$_2$S=O</th>
<th>Me$_2$S=O (2 eq)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{Br} )</td>
<td>CIICl$_2$/CHCl$_3$, 0°C ( \rightarrow ) rt, 18 h</td>
</tr>
</tbody>
</table>


9 examples (yields 28-73%); isomeric purity generally 99%.