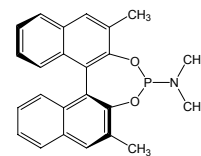


metals • inorganics • organometallics • catalysts • ligands • custom synthesis • cGMP facilities • nanomaterials

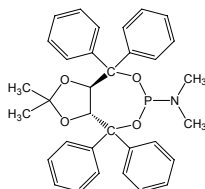
### DSM's MonoPhos™ Ligand Kit: for asymmetric hydrogenation and other catalytic applications

**Catalog # 96-5650** 1 kit  
Components include:

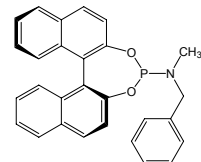
**Cat. # 15-1255**  
(S)-(+)-(2,6-Dimethyl-3,5-dioxa-4-phosphacyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)dimethylamine, min. 98%  
100mg



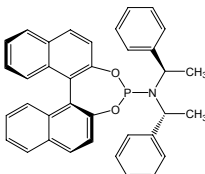
**Cat. # 15-1505**  
(3aR,8aR)-(-)-(2,2-Dimethyl-4,4,8,8-tetraphenyl-tetrahydro-[1,3]dioxolo[4,5-e][1,3,2]dioxaphosphopin-6-yl)dimethylamine, min. 98%  
100mg



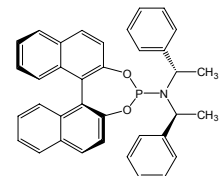
**Cat. # 15-1510**  
(S)-(+)-(3,5-Dioxa-4-phosphacyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)benzyl(methyl)amine, 99%  
100mg



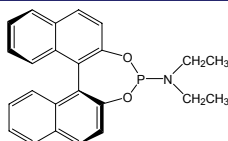
**Cat. # 15-1520**  
(S)-(+)-(3,5-Dioxa-4-phosphacyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)bis[(1R)-1-phenylethyl]amine, dichloromethane adduct, min. 95%  
100mg



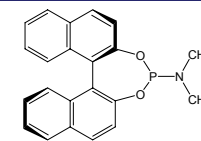
**Cat. # 15-1521**  
(S)-(+)-(3,5-Dioxa-4-phosphacyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)bis[(1S)-1-phenylethyl]amine, min. 95%  
100mg



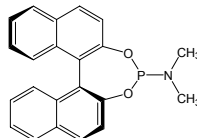
**Cat. #15-1231**  
(S)-(+)-(3,5-Dioxa-4-phosphacyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)diethylamine, min. 97%  
100mg



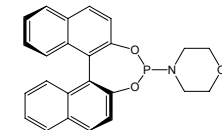
**Cat. #15-1232**  
(R)-(-)-(3,5-Dioxa-4-phosphacyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)dimethylamine, min. 97% (R)-MonoPhos  
1g



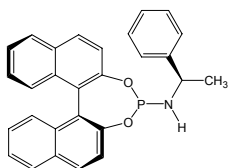
**Cat. #15-1233**  
(S)-(+)-(3,5-Dioxa-4-phosphacyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)dimethylamine, min. 97% (S)-MonoPhos  
1g



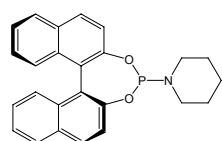
**Cat. #15-1235**  
(S)-(+)-(3,5-Dioxa-4-phosphacyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)morpholine, min. 97% (S)-MorPhos  
100mg



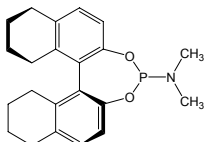
**Cat. # 15-1525**  
(S)-(+)-(3,5-Dioxa-4-phosphacyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)((1R)-1-phenylethyl)amine, min. 95%  
100mg



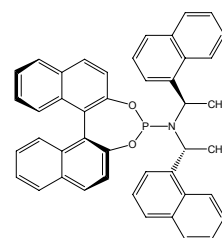
**Cat. # 15-1234**  
(S)-(+)-(3,5-Dioxa-4-phosphacyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)piperidine, min. 97% (S)-PipPhos  
100mg



**Cat. # 15-3495**  
(S)-(+)-(8,9,10,11,12,13,14,15-Octahydro-3,5-dioxa-4-phosphacyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)dimethylamine, 99%  
100mg



**Cat. # 15-1527**  
(S)-(+)-(3,5-Dioxa-4-phosphacyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)bis[(1R)-1-(1-naphthalenyl)ethyl]amine, min. 97%  
100mg



Items also available in the following sizes:

15-1255 (S)-(+)-(2,6-Dimethyl-3,5-dioxa-4-phosphacyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)dimethylamine, min. 98% [185449-86-9]  
C<sub>24</sub>H<sub>22</sub>NO<sub>2</sub>P; FW: 387.41; off-white powdr.; [α]<sub>D</sub> +636° (c 0.30, CH<sub>2</sub>Cl<sub>2</sub>); m.p. 228-229°  
*moisture sensitive*

100mg  
500mg

Technical Note:  
1. See 15-1232.

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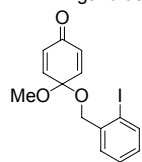
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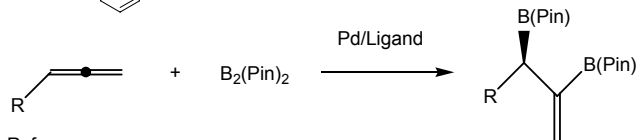
15-1505 (3aR,8aR)-(-)-(2,2-Dimethyl-4,4,8,8-tetraphenyl-tetrahydro-[1,3]dioxolo[4,5-e][1,3,2]dioxaphosphepin-6-yl) dimethylamine, min. 98% [213843-90-4] 100mg  
 C<sub>33</sub>H<sub>34</sub>NO<sub>4</sub>P; FW: 539.60; white powdr.; [α]<sub>D</sub> -159° (c 1.66, CHCl<sub>3</sub>); m.p. 218-221° *moisture sensitive* 500mg

## Technical Note:

1. Monodentate ligand for the enantioselective intramolecular reaction of prochiral cyclohexadienones.
2. Ligand use in the palladium-catalyzed, enantioselective diboration of allenes.



Tech. Note (1)  
Ref. (1)



Tech. Note (2)  
Ref. (2)

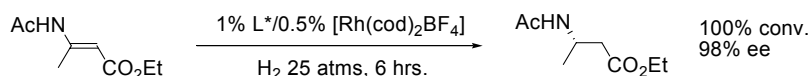
## Reference:

1. *J. Am. Chem. Soc.*, **2002**, *124*, 184.
2. *J. Am. Chem. Soc.*, **2004**, *126*, 16328.

15-1510 (S)-(+)-(3,5-Dioxa-4-phospha-cyclohepta[2,1-a;3,4-a]dinaphthalen-4-yl)benzyl(methyl)amine, 99% [490023-37-5] 100mg  
 C<sub>28</sub>H<sub>22</sub>NO<sub>2</sub>P; FW: 435.45; white powdr.; [α]<sub>D</sub> +356° (c 0.32, CHCl<sub>3</sub>); m.p. 155° *moisture sensitive* 500mg

## Technical Note:

1. A ligand used in the rhodium-catalyzed enantioselective hydrogenation of (E)-N-acylated dehydro-β-aminoacid esters. For (Z) isomer, use 15-1525.



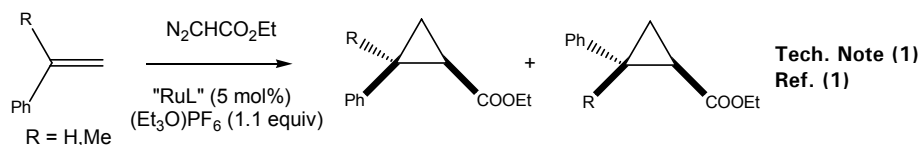
## Reference:

1. *J. Am. Chem. Soc.*, **2002**, *124*, 14552.

15-1527 (S)-(+)-(3,5-Dioxa-4-phosphacyclohepta[2,1-a;3,4-a]dinaphthalen-4-yl)bis[(1R)-1-(1-naphthalenyl)ethyl]amine, min. 97% [342813-25-6] 100mg  
 C<sub>44</sub>H<sub>34</sub>NO<sub>2</sub>P; white powdr. 500mg  
*moisture sensitive*

## Technical Note:

1. Useful ligand for the ruthenium-catalyzed, enantioselective cyclopropanation of styrenes.



Tech. Note (1)  
Ref. (1)

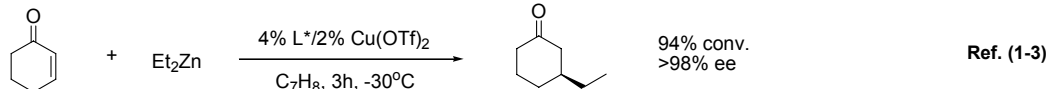
## Reference:

1. *Organometallics*, **2005**, *24*, 5221.

15-1520 (S)-(+)-(3,5-Dioxa-4-phospha-cyclohepta[2,1-a;3,4-a]dinaphthalen-4-yl)bis[(1R)-1-phenylethyl]amine, dichloromethane adduct, min. 95% [415918-91-1] 100mg  
 C<sub>36</sub>H<sub>30</sub>NO<sub>2</sub>P; FW: 539.60; white powdr.; [α]<sub>D</sub> +427° (c 0.83, CHCl<sub>3</sub>); m.p. 102-103° 500mg  
*moisture sensitive*

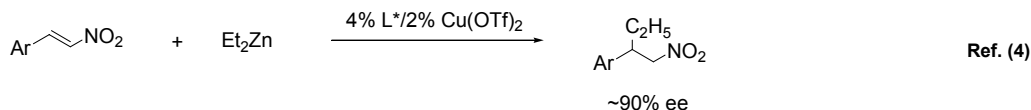
## Technical Notes:

1. A ligand for asymmetric conjugate addition of dialkyl zinc reagents to activated olefins.
  - (a) Catalytic stereocontrol of conjugate addition of dialkyl zinc reagents to enones.



Ref. (1-3)

- (b) Enantioselective addition to nitroalkenes, cinnamyl halides.



Ref. (4)

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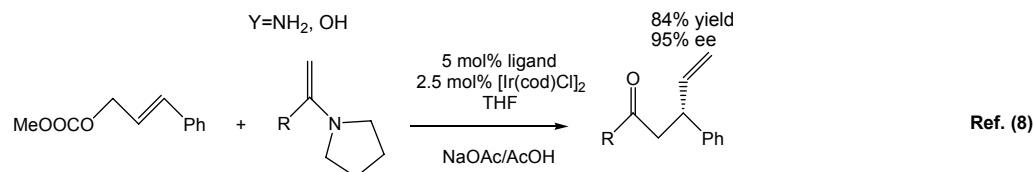
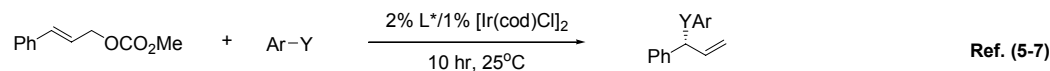
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15-1520 (S)-(+)-(3,5-Dioxa-4-phospha-cyclohepta[2,1-a;3,4-a]dinaphthalen-4-yl)bis[(1R)-1-phenylethyl]amine, dichloromethane adduct, min. 95% [415918-91-1] (cont.)

2. Ligand use in the iridium-catalyzed, enantioselective addition of nucleophiles to achiral allylic esters.



## References:

- |   |   |
|---|---|
| 1. <i>Angew. Chem. Int. Ed.</i> , <b>1997</b> , 36, 2620. | 5. <i>J. Am. Chem. Soc.</i> , <b>2002</b> , 124, 15164. |
| 2. <i>Acc. Chem. Res.</i> , <b>2000</b> , 33, 346.        | 6. <i>J. Am. Chem. Soc.</i> , <b>2003</b> , 125, 3426.  |
| 3. <i>Tetrahedron</i> , <b>2000</b> , 56, 2865.           | 7. <i>Org. Lett.</i> , <b>2005</b> , 7, 1093.           |
| 4. <i>Tetrahedron</i> , <b>2002</b> , 58, 5773.           | 8. <i>J. Am. Chem. Soc.</i> , <b>2007</b> , 129, 7720.  |

15-1521 (S)-(+)-(3,5-Dioxa-4-phospha-cyclohepta[2,1-a;3,4-a]dinaphthalen-4-yl)bis[(1S)-1-phenylethyl]amine, min. 95% [380230-02-4] 100mg  
 C<sub>36</sub>H<sub>30</sub>NO<sub>2</sub>P; FW: 539.60; off-white powdr.; [α]<sub>D</sub> +13.1° (c 1.01, CHCl<sub>3</sub>); m.p. 88-89°  
 moisture sensitive 500mg

## Technical Note:

1. See 15-1520.

15-1231 (S)-(+)-(3,5-Dioxa-4-phospha-cyclohepta[2,1-a;3,4-a]dinaphthalen-4-yl)diethylamine, min. 97% [252288-04-3] 250mg  
 C<sub>24</sub>H<sub>22</sub>NO<sub>2</sub>P; FW: 387.41; white powdr.  
 moisture sensitive 1g

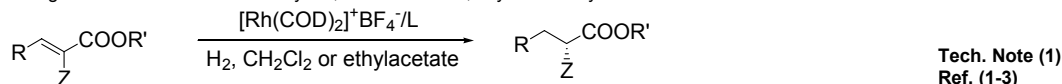
## Technical Note:

1. See 15-1232.

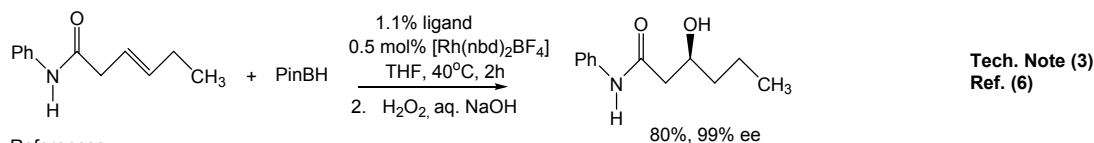
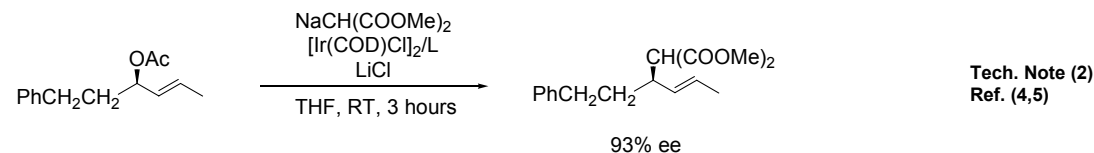
15-1232 (R)-(-)-(3,5-Dioxa-4-phospha-cyclohepta[2,1-a;3,4-a]dinaphthalen-4-yl)dimethylamine, min. 97% (R)-MONOPHOS [157488-65-8] 1g  
 C<sub>22</sub>H<sub>18</sub>NO<sub>2</sub>P; FW: 359.36; white xtl.; [α]<sub>D</sub> -583° (c 0.06, CHCl<sub>3</sub>); m.p. 190°  
 air sensitive 5g

## Technical Notes:

- Ligand used in the enantioselective, rhodium-catalyzed hydrogenation of substituted olefins, such as N-acetyldihydroamino acids, enamides, and unsaturated acids.
- Ligand used in the enantioselective, iridium-catalyzed allylic substitution of allyl acetates containing only a single substituent in the 1 or 3 position.
- Ligand use in the rhodium-catalyzed, amide directed, asymmetric hydroboration reaction.



R = H, Ph R' = H, CH<sub>3</sub> Z = NHCOCH<sub>3</sub>, CH<sub>2</sub>COOH >97% ee



## References:

- |   |  |
|---|--|
| 1. <i>J. Am. Chem. Soc.</i> , <b>2000</b> , 122, 11539. | 5. <i>Eur. J. Inorg. Chem.</i> , <b>2002</b> , 2569.   |
| 2. <i>Adv. Synth. Catal.</i> , <b>2003</b> , 345, 308.  | 6. <i>J. Am. Chem. Soc.</i> , <b>2008</b> , 130, 3734. |
| 3. <i>Adv. Synth. Catal.</i> , <b>2002</b> , 344, 1003. |  |
| 4. <i>Chem. Comm</i> , <b>1999</b> , 741.               |  |

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15-1233 (S)-(+)-(3,5-Dioxa-4-phospha-cyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)dimethylamine, min. 97% (S)-MONOPHOS [185449-80-3] 1g  
 C<sub>22</sub>H<sub>18</sub>NO<sub>2</sub>P; FW: 359.36; white xtl.; [α]<sub>D</sub> +587° (c 0.06, CHCl<sub>3</sub>); m.p. 190° 5g  
*moisture sensitive*

## Technical Notes:

- See 15-1232.
- Asymmetric hydrogenation of ketones and β-keto esters.

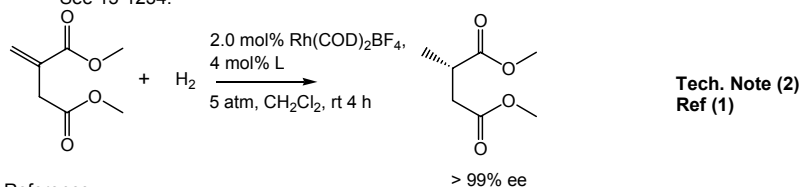
## References:

- Org. Lett.*, **2004**, 6, 4105.
- Angew. Chem. Int. Ed.*, **2004**, 43, 5066.
- J. Org. Chem.*, **2005**, 70, 943.

15-1235 (S)-(+)-(3,5-Dioxa-4-phospha-cyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)morpholine, min. 97% (S)-MorPhos [185449-81-4] 100mg  
 C<sub>24</sub>H<sub>20</sub>NO<sub>3</sub>P; FW: 401.39; white powdr. 500mg  
*moisture sensitive*

## Technical Notes:

- See 15-1232.
- Ligand used in the enantioselective rhodium catalyzed low pressure high activity hydrogenation of α-dehydroaminoesters, enamides, and dimethylitaconate. See 15-1234.



## Reference:

- J. Org. Chem.*, **2005**, 70, 943.

15-1525 (S)-(+)-(3,5-Dioxa-4-phospha-cyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)[(1R)-1-phenylethyl]amine, min. 95% [422509-53-3] 100mg  
 C<sub>28</sub>H<sub>22</sub>NO<sub>2</sub>P; FW: 435.45; white powdr.; [α]<sub>D</sub> +3.5° (c 1.01, CHCl<sub>3</sub>); m.p. 212-213° 500mg  
*moisture sensitive*

## Technical Note:

- See 15-1510.

15-1234 (S)-(+)-(3,5-Dioxa-4-phospha-cyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)piperidine, min. 97% (S)-PipPhos [284472-79-3] 100mg  
 C<sub>25</sub>H<sub>22</sub>NO<sub>2</sub>P; FW: 399.42; white powdr. 500mg  
*moisture sensitive*

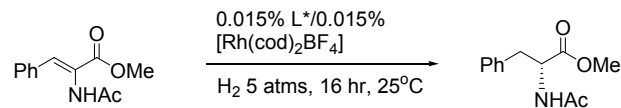
## Technical Note:

- See 15-1232.

15-3495 (S)-(+)-(8,9,10,11,12,13,14,15-Octahydro-3,5-dioxa-4-phospha-cyclohepta[2,1-a;3,4-a']dinaphthalen-4-yl)dimethylamine, 99% [389130-06-7] 100mg  
 C<sub>22</sub>H<sub>26</sub>NO<sub>2</sub>P; FW: 367.42; white powdr.; [α]<sub>D</sub> +318° (c 0.63, THF); m.p. 112-113° 500mg  
*moisture sensitive, (store cold)*

## Technical Note:

- A ligand for enantioselective hydrogenation of prochiral functional olefins.



## Reference:

- Adv. Synth. Catal.*, **2003**, 345, 308.

Note: Sold in collaboration with DSM for research purposes only. Patent WO 0204466.

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