Enantioselective Rhodium-Catalyzed Allylation of 2-Pyridones

**Significance:** Enantioenriched N-substituted 2-pyridones are an important class of biologically active molecules. Their synthesis has been described starting from chiral electrophiles (Y.-Q. Fang et al. *J. Am. Chem. Soc.* 2010, 132, 15525) and chiral amines (Y. Yu et al. *J. Nat. Prod.* 2013, 76, 2226). The authors report a chiral allylation strategy beginning from 2-pyridones and allenes.

**Comment:** Almost all substrates preferred N-allylation over O-allylation, except the 5-iodopyridone substrate. A 1:1 mixture of N/O-allylated products was observed in this case. Substitution on the allene component was also tolerated, including a tertiary alcohol. A decrease in N/O selectivity was observed for the substrate with a phthalamido group.

**Key words**
- rhodium
- bisphosphine ligands
- 2-pyridones

**Proposed catalytic cycle:**

1. **Resting state**
2. **Initial complex formation**
3. **Catalytic cycle initiation**
4. **Catalytic cycle completion**

**Selected examples:**

<table>
<thead>
<tr>
<th>Ligand</th>
<th>Product</th>
<th>N/O</th>
<th>Yield (%)</th>
<th>ee (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>O,N</td>
<td></td>
<td>N/O &gt; 20:1</td>
<td>99%</td>
<td>87% ee</td>
</tr>
<tr>
<td>O,N</td>
<td></td>
<td>N/O &gt; 13:1</td>
<td>98%</td>
<td>91% ee</td>
</tr>
<tr>
<td>O,N</td>
<td></td>
<td>N/O = 1:1</td>
<td>49%</td>
<td>91% ee</td>
</tr>
<tr>
<td>O,N</td>
<td></td>
<td>N/O = 4:1</td>
<td>74%</td>
<td>91% ee</td>
</tr>
<tr>
<td>O,N</td>
<td></td>
<td>N/O &gt; 20:1</td>
<td>93%</td>
<td>93% ee</td>
</tr>
</tbody>
</table>

**Ligand**
- MeO
- MeO
- PAr₂
- PAr₂

**Proposed catalytic cycle diagrams**

- RhL⁺
- RhL⁻
- RHL⁺
- RHL⁻

**Rhodium complexes:**
- [Rh(cod)Cl₂] (5 mol%)
- ligand (10 mol%)
- phosphoric acid (5 mol%)

**Results:**
- up to 98% ee
- up to 99% yield
- up to >20:1 N/O selectivity

**Scale:**
- 0.3 mmol scale
- 24 examples