Remarkable Enhancement of Enantioselectivity in the Asymmetric Conjugate Addition of Dimethylzinc to (Z)-Nitroalkenes with a Catalytic [(MeCN)\(_4\)Cu]PF\(_6\)–Hoveyda Ligand Complex


Asymmetric Conjugate Addition of Dimethylzinc to (Z)-Nitroalkenes

**Significance:** Asymmetric conjugate addition of organometallic species to nitroalkenes can be an efficient way to access all-carbon quaternary stereocenters. Herein, the authors demonstrate that the use of [(MeCN)\(_4\)Cu]PF\(_6\) plays a crucial role in the asymmetric conjugate addition of dimethylzinc to (Z)-nitroalkenes with the Hoveyda ligand.

**Comment:** With the reported conditions, the undesired nitroalkene isomerization, resulting in low enantioselectivity, has been solved. The authors also developed a practical and highly controlled method for the synthesis of (Z)-nitroalkenes (Z/E ratio ≥ 99:1).

**Selected examples:**

<table>
<thead>
<tr>
<th>R(_1)NO(_2)</th>
<th>R(_2)</th>
<th>% yield</th>
<th>ee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Br</td>
<td></td>
<td>91%</td>
<td>95% ee</td>
</tr>
<tr>
<td>Cl</td>
<td></td>
<td>91%</td>
<td>93% ee</td>
</tr>
<tr>
<td>Br</td>
<td></td>
<td>92%</td>
<td>98% ee</td>
</tr>
<tr>
<td>Br</td>
<td></td>
<td>96%</td>
<td>94% ee</td>
</tr>
</tbody>
</table>

**Preparation of the (Z)-nitroalkenes:**

\[
\begin{align*}
\text{R}^1\text{O} & \text{MeNO}_2 \text{ NaH} \rightarrow \text{R}^1\text{O} \rightarrow \text{R}^1\text{O} \rightarrow \text{R}^1\text{O} \\
\text{DMF, 0 °C} & \text{to r.t.} \rightarrow \text{R}^2\text{MeX} \rightarrow \text{R}^2\text{MeX} \rightarrow \text{R}^2\text{MeX} \\
72–96% & \text{yield} \rightarrow 78–91% \text{yield} \rightarrow 73–98% \text{yield} \rightarrow Z/E \geq 99:1
\end{align*}
\]

**Derivatization of the nitroalkane:**

\[
\begin{align*}
\text{NO}_2 & \text{Br} \rightarrow \text{NO}_2 \rightarrow \text{NO}_2 \rightarrow \text{NO}_2 \\
\text{Br} & \text{KOH} \rightarrow \text{Br} \rightarrow \text{Br} \rightarrow \text{Br} \\
\text{CH}_2 \text{OH, 0 °C} & \rightarrow \text{CH}_2 \text{OH, 0 °C} \rightarrow \text{CH}_2 \text{OH, 0 °C} \rightarrow \text{CH}_2 \text{OH, 0 °C} \\
95% & \text{ee} \rightarrow 74% \text{yield} \rightarrow 99% \text{yield} \rightarrow 94% \text{ yield}
\end{align*}
\]