Chemoselective Reduction of \(\alpha,\beta\)-Unsaturated Aldehydes with AuNPore

Results:

\[
\begin{align*}
\text{ benzaldehyde: } & \text{ 73% yield, } 2/3 > 99:1 \\
\text{ cinnamaldehyde: } & \text{ 70% yield, } 2/3 = 100:0 \\
\text{ \textbf{MeO:} cinnamaldehyde: } & \text{ 71% yield, } 2/3 = 89:11 \\
\text{ \textbf{MeO:} cinnamaldehyde: } & \text{ 78% yield, } 2/3 = 91:9 \\
\text{ \textbf{MeO:} cinnamaldehyde: } & \text{ 70% yield, } 2/3 = 91:9 \\
\text{ \textbf{MeO:} cinnamaldehyde: } & \text{ 70% yield, } 2/3 = 82:18 \\
\text{ \textbf{MeO:} cinnamaldehyde: } & \text{ 75% yield, } 2/3 = 100:0 \\
\text{ \textbf{MeO:} cinnamaldehyde: } & \text{ 70% yield, } 2/3 > 99:1 \\
\text{ \textbf{X = Br:} } & \text{ 46% yield, } 2/3 = 99:1 \\
\text{ \textbf{X = F:} } & \text{ 69% yield, } 2/3 = 99:1 \\
\text{ \textbf{n-Pent:} } & \text{ 62% yield, } 2/3 = 97:3
\end{align*}
\]

Significance: Nanoporous gold (AuNPore) catalyzed the 1,2-reduction of \(\alpha,\beta\)-unsaturated aldehydes 1 with triethylsilane. The reduction was carried out in the presence of water and triethylamine to give the corresponding allyl alcohols 2 in 42–78% yield with 82:18 to 100:0 \(2/3\) chemoselectivity.

Comment: Previously, the authors reported the AuNPore-catalyzed chemoselective reduction of imines with dimethylphenylsilane (Org. Lett. 2014, 16, 2558). In the reduction of cinnamyl aldehyde, the catalytic activity of AuNPore was superior to that of Au30Ag70 alloy, homogeneous AuCl(Ph3P)/Bu3P, and AuCl/IPr-HCl. ICP-MS analysis showed that no gold content was leached from the catalyst during the reaction.