The First Practical Method for Asymmetric Epoxidation

Sir:

As revealed in Scheme 1, we have discovered a new metal-catalyzed asymmetric epoxidation process which is far more selective than any of the previously described methods\(^1\) for this type of asymmetric transformation. The simplicity of this new method is one of its more attractive aspects; the necessary components [(\(+\)) or (\(-\))-diethyl tartrate,\(^2\) titanium tetraisopropoxide, and \textit{tert}-butyl hydroperoxide] are all\(^3\) commercially available at low to moderate cost.\(^4\)

Scheme 1

\[
\begin{align*}
\text{D-(-)-diethyl tartrate (unnatural)} & \quad \xrightarrow{(CH_2)\text{COOH, Ti(IV)OPr}_3} \quad \text{R}_5 \quad \xrightarrow{\text{CH}_2\text{Cl}_2, -20^\circ\text{C}} \quad \text{R}_3 \quad \xrightarrow{70 - 87\% \text{ yields, } >98\% \text{ ee.}} \quad \text{R}_2 \quad \xrightarrow{\text{OH}} \quad \text{R}_4
\end{align*}
\]

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\textit{Received May 5, 1980}

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Presented to the Department of Chemistry, Stanford University

2008