Enolate Chemistry II

The Ivanov Reaction

To achieve high diastereo- and enantioselectivity, it is necessary to:

- control the enolization step
- use an auxiliary with a large diastereofacial bias
- control competing transition states, e.g.
  - half-chair vs. twist boat
  - closed vs. open
- use metal-derivatives that have clearly defined coordination geometries.

The stereochemical implications of the Zimmerman-Traxler transition state model for the aldol reaction can be summarized as follows:
Zimmerman-Traxler transition states represent the most frequently used models, but other possibilities have always to be considered as well:

Chair vs. boat

\[
\begin{align*}
\text{OMet} & \quad \text{RCHO} \quad \text{OMet} \\
\text{Rc} & \quad \text{H} \quad \text{Me} \\
\end{align*}
\]

half-chair

\[
\begin{align*}
\text{Rc} & \quad \text{H} \quad \text{Me} \\
\text{R} & \quad \text{O} \quad \text{OH} \\
\end{align*}
\]

syn-diastereomer

anti-diastereomer

Enolization

\[
\text{OEt} \quad \overset{\text{LDA, THF}}{\longrightarrow} \quad \text{OLi} \quad + \quad \text{OLi}
\]

\[
\text{OEt} \quad \overset{\text{TBS-Cl, HMPA}}{\longrightarrow} \quad \text{OTBS} \quad + \quad \text{OTBS}
\]

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a. Lithium enolates

\[
\begin{align*}
\text{OEt} & \quad \overset{\text{1. LDA, THF, 23% HMPA}}{\longrightarrow} \quad \text{OTBS} \quad + \quad \text{OTBS} \\
\text{OEt} & \quad \overset{\text{2. TBS-Cl}}{\longrightarrow} \quad \text{OTBS} \quad + \quad \text{OTBS}
\end{align*}
\]

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Transition states for enolization:

\[ \begin{align*}
& \text{favored with } \text{LDA/THF} \\
& \text{favored with } \text{LDA/THF/HMPA}
\end{align*} \]

\( A^{1,3} \)

\( \text{diagonal interaction} \)

Kinetic ratios for LDA/THF enolization:

\[ \begin{align*}
\text{OMe} & : 95 : 5 \\
\text{O-\( t \)-Bu} & : 95 : 5 \\
\text{Et} & : 50 : 50 \\
\text{\( i \)-Pr} & : 40 : 60 \\
\text{\( t \)-Bu} & : 0 : 100 \\
\text{Ph} & : 0 : 100 \\
\text{NEt}_2 & : 0 : 100
\end{align*} \]

(cf. Dauben, JACS 1985, 107, 2264)
Dr. P. Wipf
Evans’ Chiral Oxazolidinone Auxiliary

D. A. Evans, JACS 1981, 103, 2127