Iridium-Catalyzed Asymmetric Hydroalkynylation of Unactivated Alkenes

Significance: The authors have developed an enantioselective iridium-catalyzed hydroalkynylation reaction. The reaction transforms trisubstituted \( \beta,\gamma \)-unsaturated amides with excellent \( \gamma \)-selectivity, forming new alkyne-substituted acyclic quaternary carbon stereocenters.

Comment: The kinetic isotope experiments of the alkenes resulted in an inverse KIE; suggesting that the migratory insertion of the alkenes is related to the turnover-limiting step. Notably, the authors propose that the selectivity arises from both a facial preference as well as an alkene isomerization process.

Kinetic isotope effect of alkene:

\[
\begin{align*}
\text{Ir(cod)\textsubscript{2}OTf (10 mol\%)} & \quad \text{(R)-ligand (12 mol\%)} \\
\text{o-C\textsubscript{6}H\textsubscript{4}F\textsubscript{2}, 20 °C, 84 h} & \quad \begin{array}{c}
\text{Ir(cod)\textsubscript{2}OTf (10 mol\%)} \\
\text{(R)-ligand (12 mol\%)} \\
1,2\text{-dichlorobenzene} \\
50 °C
\end{array}
\end{align*}
\]

\[
k_H/k_D = 0.90
\]

Selected examples:

- \( R^1 = \text{CH}_2\text{CH}_2\text{OMe} \):
  - 65% yield, \( \text{er} = 95.5 \)
  - 52% yield, \( \text{er} = 98.5:1.5 \)
  - 75% yield, \( \text{er} = 96:4 \)
  - 80% yield, \( \text{er} = 95.5 \)
  - 22% yield, \( \text{er} = 93.7 \)
  - 80% yield, \( \text{er} = 96:3.5 \)

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