Cyclization of 1-(Trifluoromethyl)-4-alkyn-1-ones with Arylboronic Acids

Significance: Lautens and co-workers report a rhodium-catalyzed cyclization of 1-(trifluoromethyl)-4-alkyn-1-ones with variously substituted arylboronic acids to obtain (trifluoromethyl)cyclobutanols bearing an exocyclic double bond.

Comment: The reactivity of the newly formed exocyclic double bond was explored by subjecting a (trifluoromethyl)cyclobutanol to an epoxidation reaction using MCPBA and an ozonolysis.

**Equation:**

\[
\text{F}_3\text{C} \quad \overset{\text{R}^1}{\text{O}} \quad \underset{\text{R}^2}{\text{Et}} + \overset{\text{R}^1}{\text{B(OH)}_2} \quad \underset{\text{R}^2}{\text{Et}} \rightarrow \quad \underset{\text{R}^1}{\text{CF}_3} \quad \overset{\text{O}}{\text{OH}} \quad \underset{\text{R}^2}{\text{Et}}
\]

\[\text{[Rh(coe)Cl}_2\text{]} (2.5 \text{ mol%}) \quad \text{ligand L (5.0 \text{ mol%})} \quad \text{Et}_3\text{N (1.5 equiv)} \quad \text{dioxane–MeOH (1:1)} \quad \text{r.t. to 40 °C, 6-20 h}\]

\[\text{R}^1 = \text{Me, Et, Bn} \quad \text{R}^2 = \text{H, Me, OH, OMe, CO}_2\text{Me, F, Br, Ac, CH}_2\text{OH, NHBoc, CHO} \]

\[\text{coe = cyclooctene}\]

**Selected examples:**

\[\text{CF}_3 \quad \overset{\text{OMe}}{\text{OH}} \quad \underset{\text{Et}}{\text{Et}} \quad \text{56% yield} \quad \text{90% ee}\]

\[\text{CF}_3 \quad \overset{\text{F}}{\text{O}} \quad \underset{\text{Et}}{\text{Et}} \quad \text{65% yield} \quad \text{95% ee}\]

\[\text{CF}_3 \quad \overset{\text{OH}}{\text{O}} \quad \underset{\text{Et}}{\text{Et}} \quad \text{65% yield} \quad \text{95% ee}\]

\[\text{CF}_3 \quad \overset{\text{OMe}}{\text{OH}} \quad \underset{\text{Et}}{\text{Et}} \quad \text{53% yield} \quad \text{92% ee}\]

\[\text{CF}_3 \quad \overset{\text{OH}}{\text{O}} \quad \underset{\text{Et}}{\text{Et}} \quad \text{41% yield} \quad \text{50% ee}\]

\[\text{CF}_3 \quad \overset{\text{Br}}{\text{OH}} \quad \underset{\text{Et}}{\text{Et}} \quad \text{83% yield} \quad \text{95% ee}\]

\[\text{CF}_3 \quad \overset{\text{OH}}{\text{O}} \quad \underset{\text{Et}}{\text{Et}} \quad \text{52% yield} \quad \text{93% ee}\]

\[\text{CF}_3 \quad \overset{\text{Br}}{\text{O}} \quad \underset{\text{Et}}{\text{Et}} \quad \text{42% yield} \quad \text{89% ee}\]