Asymmetric Friedel–Crafts Reaction Using a Chiral-at-Metal Iridium Catalyst

**Significance:** The widespread use of asymmetric catalysis in academia and industry can be directly attributed to the vast array of synthetically and commercially available chiral ligands. However, the utilization of chiral-at-metal complexes in asymmetric catalysis is relatively underdeveloped. Here, the authors report the efficient synthesis of a chiral-at-iridium catalyst and its application to an asymmetric Friedel–Crafts reaction.

**Comment:** The authors present the asymmetric Friedel–Crafts reaction of indoles and acyl imidazole derivatives using a chiral-at-iridium complex as catalyst. The reaction proceeds with excellent yields and selectivities by employing a low loading (1–2 mol%) of this interesting catalyst. The authors suggest that once coordinated, the achiral ligands block the re face of the indole, resulting in a highly selective si-face attack.

**Overall transformation:**

\[
\text{R}^3 - \text{R}^4 \stackrel{\text{THF, r.t., 18–60 h (0.3 mmol scale)}}{\text{ IrCl}_3 \cdot 3\text{H}_2\text{O}} \rightarrow \text{R}^3 - \text{R}^4
\]

**Selected examples:**

- 97% yield, 96% ee (1 mol% \(\Lambda\)-1)
- 99% yield, 94% ee (1 mol% \(\Delta\)-1)

**Synthesis of chiral-at-metal iridium complexes (\(\Lambda\)-1 and \(\Delta\)-1):**

1. \(\text{IrCl}_3 \cdot 3\text{H}_2\text{O}, \text{EtO(CH}_2\text{)}_2\text{OH-H}_2\text{O (3:1)} \) reflux
2. Chromatographic resolution

- \(\Lambda\)-(S), 39% yield
- \(\Delta\)-(S), 47% yield

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