Asymmetric 1,2-Dicarbofunctionalization of Alkenes with Copper/Chiral Phosphoric Acid System

**Significance:** Owing to their ready availability, asymmetric dicarbofunctionalization of alkenes remains an important topic in catalysis. The authors report a three-component asymmetric difunctionalization of 1,1-disubstituted alkenes with a radical initiator and heteroaryl nucleophile using copper and chiral phosphoric acid (CPA) catalyst.

**Comment:** The reaction proceeds through a Kharasch-type addition across the unactivated olefin, whereupon the resultant tertiary radical undergoes a SET to form a tertiary cation. The CPA’s H-bonding affects the facial selectivity of the attack of the indole moiety in an asymmetric fashion to form the products.

**Proposed mechanism:**

**Selected examples:**

- \( \text{R}^1 = n-C_4F_9 \text{SO}_2Cl \)
  - 96% yield, 95% ee
- \( \text{R}^1 = n-C_4F_9 \text{SO}_2Cl \)
  - 97% yield, 95% ee
- \( \text{R}^1 = \text{Togni’s reagent} \)
  - 61% yield, 98% ee