Gd-Catalyzed Photocycloaddition of Aryl Cyclopropyl Ketones to Alkenes

**Significance:** The authors report a gadolinium-catalyzed asymmetric [3+2] photocycloaddition of aryl cyclopropyl ketones with alkenes. A variety of chiral cyclopentanes were obtained in high yields (≤95%) and stereoselectivities (up to >99% ee and dr up to >20:1).

**Comment:** This result demonstrates that a combination of a chiral Lewis acid and photoredox catalysis offers a robust and potentially general approach to photochemical stereocontrol that is broadly applicable to the increasing number of powerful transformations achievable by using photoredox catalysis.

**Proposed mechanism:**

**Selected examples:**

- **90% yield**
  - 93% ee, dr = 3:1

- **77% yield**
  - 96% ee, dr = 3:1

- **89% yield**
  - 91% ee, dr = 3:2

- **81% yield**
  - 89% ee, dr = 2:1

- **95% yield**
  - >99% ee, dr = 2:1

- **89% yield**
  - 91% ee, dr = 3:1

- **81% yield**
  - 89% ee, dr = 2:1

- **95% yield**
  - >99% ee, dr = 2:1

- **77% yield**
  - 88% ee, dr = 5:1

**Key words:**
- cycloaddition
- photoredox reaction
- gadolinium catalysis

**Category:**
- Metal-Catalyzed
- Asymmetric
- Synthesis and Stereoselective
- Reactions

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