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Enantioselective Photochemistry through Lewis Acid-Catalyzed Triplet Energy Transfer
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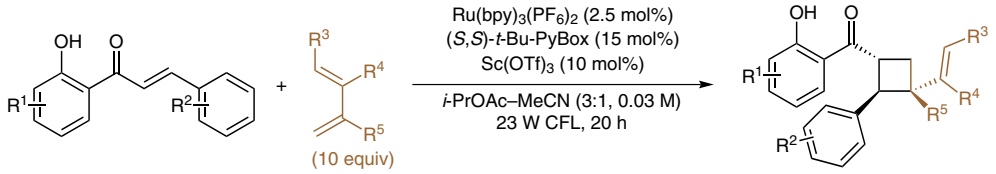
Category

Metal-Catalyzed Asymmetric Synthesis and Stereoselective Reactions

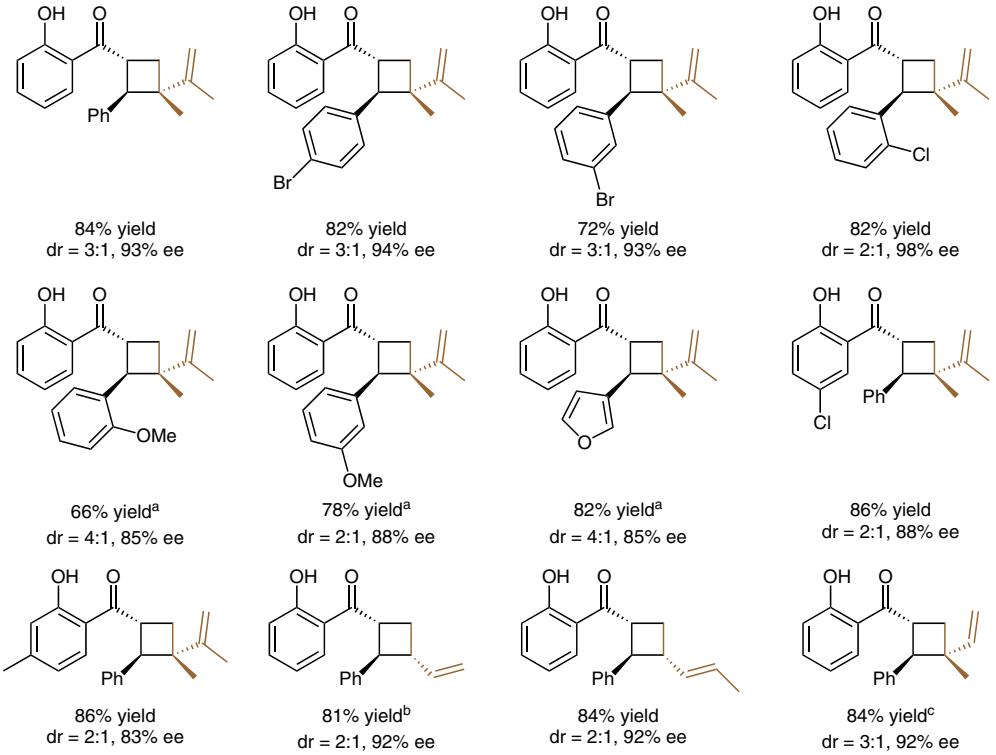
Key words

ruthenium catalysis
photocatalysis
photocycloaddition
hydroxychalcones
dienes

Ruthenium-Catalyzed Asymmetric Photocycloaddition of 2′-Hydroxychalcones



Selected examples:



[a] Irradiation with a blue LED lamp instead of a 23 W CFL bulb (irradiation time: 2 h).
[b] Irradiation time: 40 h. [c] Isolated as a 6:1 mixture of regioisomers.

Significance: A chiral scandium–ligand complex was shown to catalyze triplet energy transfer from an electronically excited photosensitizer. This strategy can be applied to the asymmetric [2+2] photocycloaddition of 2′-hydroxychalcones and dienes with tris(bipyridyl)ruthenium(II) as a sensitizer.

Comment: This protocol permits ready access to chiral [2+2] cycloadducts bearing three contiguous stereocenters in good yields and with high enantioselectivities. Several lines of evidence support a mechanism in which the coordination of the scandium catalyst dramatically lowers the triplet energy of the 2′-hydroxychalcone.

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