**Category**

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

**Key words**

**nickel**

**reductive coupling**

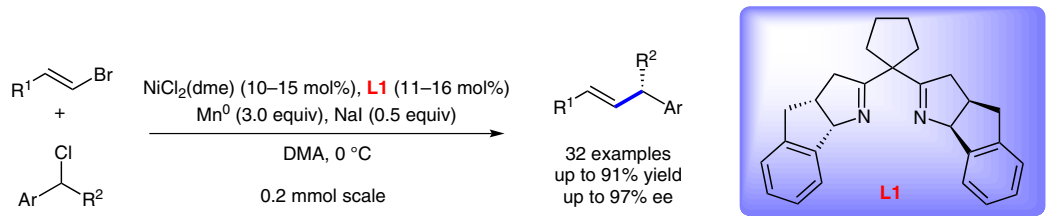
**vinyl bromides**

**benzyl chlorides**

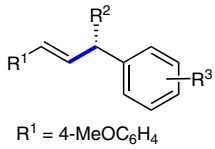
A. H. CHERNEY, S. E. REISMAN* (CALIFORNIA INSTITUTE OF TECHNOLOGY, PASADENA, USA)

Nickel-Catalyzed Asymmetric Reductive Cross-Coupling Between Vinyl and Benzyl Electrophiles
*J. Am. Chem. Soc.* **2014**, *136*, 14365–14368.

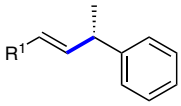
# Nickel-Catalyzed Asymmetric Reductive Coupling of Vinyl and Benzyl Halides



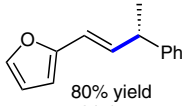

**Selected examples:**



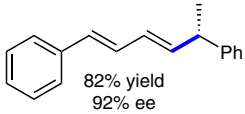

| $R^2$ | $R^3$ | Yield (%) | ee (%) |
|---|---|---|---|
| Me | H | 91 | 93 |
| Me | 2-Me | 44 | 85 |
| Me | 4-OMe | 64 | 93 |
| Et | H | 80 | 97 |
| Bn | H | 82 | 93 |



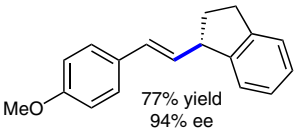

| $R^1$ | Yield (%) | ee (%) |
|---|---|---|
| 4-$MeC_6H_4$ | 83 | 96 |
| 4-$FC_6H_4$ | 74 | 94 |
| 4-$ClC_6H_4$ | 66 | 95 |
| 4-$BPinC_6H_4$ | 59 | 94 |
| 4-$OHC_6H_4$ | 86 | 93 |




80% yield
91% ee




82% yield
92% ee




77% yield
94% ee

**Significance:** The nickel-catalyzed reductive coupling of two organic electrophiles offers a unique synthetic approach to form C–C bonds (see Review below). Reisman and co-workers report an enantioselective Ni-catalyzed reductive coupling of vinyl bromides and racemic benzylic chlorides, giving rise to substituted alkenes bearing a chiral tertiary allylic center. Although transition-metal-catalyzed allylic alkylation methods using activated organometallic reagents can provide access to similar motifs, there are few regio- and enantioselective methods for the arylation of acyclic, unsymmetrical α,γ-disubstituted allylic electrophiles (for one recent example, see: S. Son, G. C. Fu *J. Am. Chem. Soc.* **2008**, *130*, 2756).

**Comment:** Using this method, a wide range of electron-rich and electron-deficient vinyl bromides and benzylic chlorides can be employed. Both *meta* and *para* substitution on the benzyl chloride component are well tolerated. However, *ortho*-substituted benzyl chloride derivatives demonstrate poor reactivity and lead to lower enantioselectivities. The coupled products are obtained in good to modest yields with generally high enantioselectivity. The use of β-substituted benzyl chlorides does not lead to any erosion in enantiomeric excess. Experiments using radical inhibitors or radical clocks are inconsistent with a radical chain mechanism.

**Review:** D. A. Everson, D. J. Weix *J. Org. Chem.* **2014**, *79*, 4793–4798.

**SYNFACTS Contributors:** Mark Lautens, Christine M. Le
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