

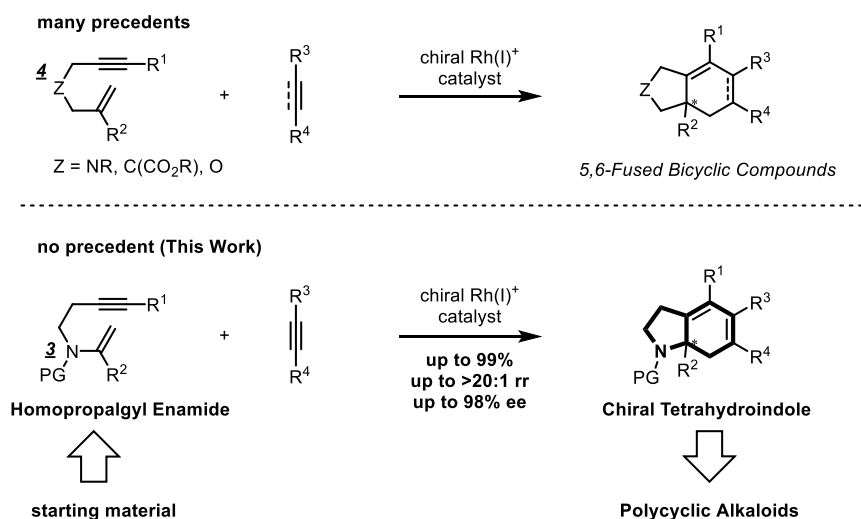
## Cationic Rhodium(I)-Catalyzed Asymmetric [2+2+2] Cycloaddition of Homopropargyl Enamides with Alkynes

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The transition-metal-catalyzed asymmetric [2+2+2] cycloaddition of 1,6-enynes with unsaturated compounds is a useful method for the construction of chiral bicyclic scaffolds in a highly efficient and atom-economical manner. For this transformation, cationic rhodium(I)/axially chiral biaryl bisphosphine complexes show high reactivity and selectivity. The asymmetric [2+2+2] cycloaddition reactions with alkynes or alkenes were reported by several groups.<sup>1</sup> However, these reports employed 4-position tethered 1,6-enynes that were easily synthesized.

In this research, we have achieved the unprecedented catalytic asymmetric [2+2+2] cycloaddition of homopropargyl enamides with alkynes. First, we synthesized homopropargyl enamides that possess enamide moieties as new 3-position tethered 1,6-enynes by efficient and general synthetic routes. The rhodium-catalyzed asymmetric [2+2+2] cycloaddition of the obtained homopropargyl enamides with alkynes produced tetrahydroindole derivatives with high yields and ee values. Additionally, for demonstration of the synthetic utility of this asymmetric [2+2+2] cycloaddition, we applied chiral tetrahydroindole to the total synthesis of polycyclic alkaloids.



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