Enantioselective Gold(I)-Catalyzed Intermolecular [4+2] Annulation between Propiolates and Alkenes

Hanbyul Kim, Su Yeon Choi, Seunghoon Shin
Department of Chemistry and Center for New Directions in Organic Synthesis (CNOS), Hanyang University, Seoul 04763, Korea

The α,β-unsaturated-δ-lactone scaffolds are found in a number of medicinal and natural compounds, displaying an array of significant biological activities. Based on the powerful alkynophilic activation of homogeneous Au(I)-catalysis, we recently demonstrated that the dihydropyranones could be assembled in a single step from the intermolecular reaction of propiolates with alkenes. However, achieving high level of stereocontrol has remained elusive in this case of intermolecular coupling. The enantio-determining step involves discrimination of prochiral face of the alkene nucleophile, approaching away from the linearly coordinated Au(L*) complex (Type I, Figure 1). Therefore, in the absence of a tether, intermolecular coupling presents a formidable challenge. Most successful examples of intermolecular enantioselective gold(I)-catalysis have involved face-selective coordination on the sp²-alkenes/allenes or σ-bound Au(I) complexes. Herein, we demonstrated a highly enantioselective (upto 95 %ee) route toward the dihydropyranones for diverse alkene nucleophiles, utilizing a non-conventional counter-anion (SDS) in 1,1,2,2-tetrachloroethane as solvent (Scheme 1).

Figure 1. Types of enantio-determining step in intermolecular asymmetric Au(I)-catalysis

Scheme 1. Enantioselective intermolecular [4+2] annulation

References
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Corresponding author email: sshin@hanyang.ac.kr