Academic Program [Oral B] | 10. Organic Chemistry -Organometallic Compounds-：Oral B

Tue. Mar 19, 2024 3:55 PM - 4:35 PM JST | Tue. Mar 19, 2024 6:55 AM - 7:35 AM UTC E1112(1112, Bldg. 11 [1F])

[E1112-2vn] 10. Organic Chemistry -Organometallic Compounds-

Chair: Takahiro Iwamoto

English

3:55 PM - 4:15 PM JST | 6:55 AM - 7:15 AM UTC

[E1112-2vn-01]

Selective Synthesis of 4-Sulfonylindoles by Gold-catalyzed Consecutive Cyclization-Sulfonyl Migration

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English

4:15 PM - 4:35 PM JST | 7:15 AM - 7:35 AM UTC

[E1112-2vn-02]

Silver-Catalyzed Asymmetric Aldol Reaction and Michael Reaction of Activated Isocyanides

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Selective Synthesis of 4-Sulfonylindoles by Gold-catalyzed Consecutive Cyclization-Sulfonyl Migration

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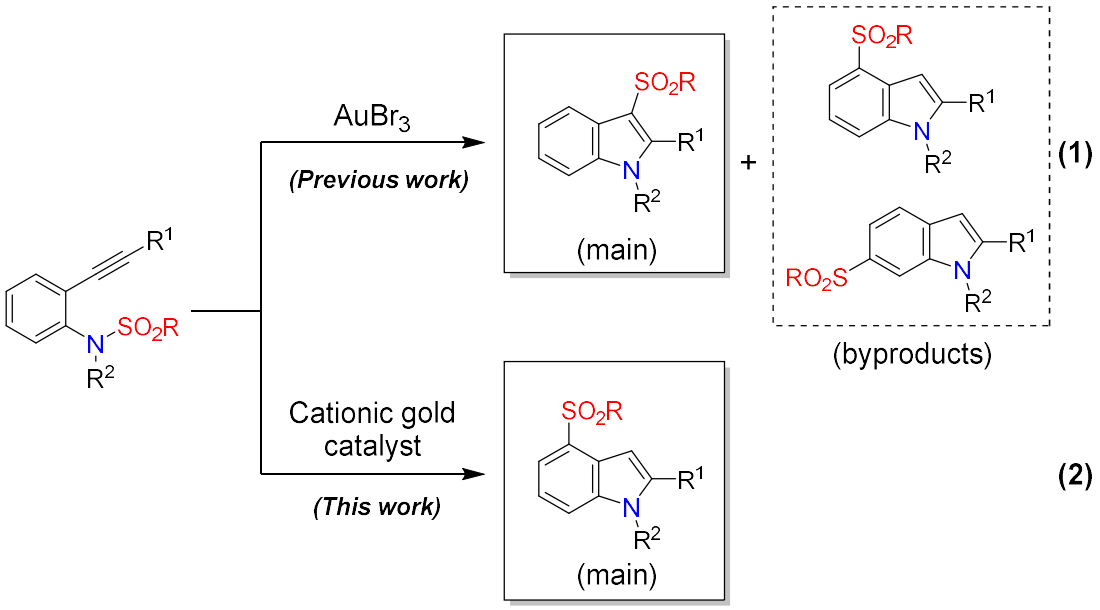
Keywords: Gold catalyst; Indole; Rearrangement; Cyclization; Alkyne

π-Lewis acid-catalyzed cyclization reactions of *ortho*-alkynylanilines have been widely used to synthesize indole derivatives that are difficult to be synthesized by direct electrophilic substitution of indole substrates.[1-4] Previously, our group reported $AuBr_3$-catalyzed cycloisomerization reactions of *ortho*-alkynyl-*N*-sulfonylanilines to form 3-sulfonylindoles with high efficiency,[5] along with small amounts of 4- and 6- sulfonylated byproducts (Scheme 1). The presence of 4-sulfonylindoles aroused our interest, because 4-substituted indole skeleton is presented in various bioactive molecules, while it is hard to synthesize due to poor electron density at C4 position and generally requires additional directing groups to accomplish.[6]

In this work, we report that 4-sulfonylindole can be obtained as the main product by using cationic gold catalyst and controlling reaction conditions (Scheme 2). Factors influencing the product selectivity and a mechanism based on DFT calculations and control experiments will be discussed.



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Silver-Catalyzed Asymmetric Aldol Reaction and Michael Reaction of Activated Isocyanides

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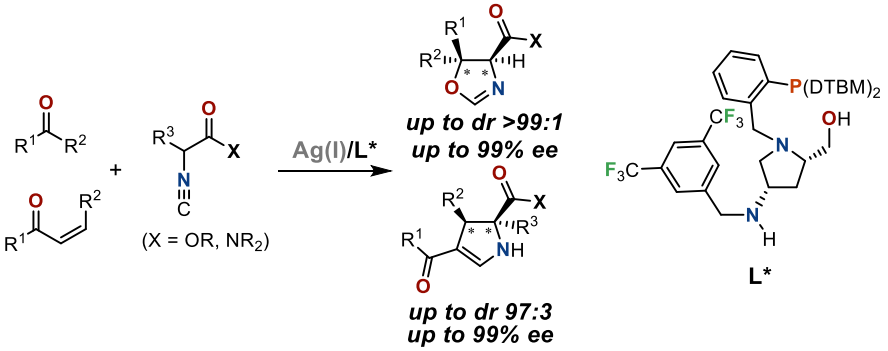
Keywords: Silver Catalysis; Isocyanide; Asymmetric Aldol Reaction; Asymmetric Michael Addition Reaction; DFT Calculation

Asymmetric aldol reactions are powerful carbon-carbon bond formation reactions. Especially, the asymmetric aldol reactions of isocyanoacetic acid derivatives proceed with successive cyclization to produce chiral oxazolines, which can be transformed into β-hydroxy-α-amino acids by hydrolysis. While the reactions using aryl ketones or sterically accessible dialkyl ketones were reported,[1] the reaction using sterically and electronically unbiassed ketones was elusive.

Our original chiral prolinol-phosphine ligands enable promotion and stereocontrol of aldol reactions with aldehydes by forming multiple hydrogen bonds with the carbonyl group of the substrates.[2] The newly developed ligands bearing a secondary amino group showed excellent performance in the asymmetric aldol reactions of isocyanoacetoamides with various ketones. In particular, bulky dialkyl ketones such as pinacolone were competent giving the products in highly diastereo- and enantioselective manner. Furthermore, the same catalytic system can be applied to the asymmetric Michael reactions of α-substituted isocyanoacetates with α,β-unsaturated ketones, affording the cyclized products with high stereoselectivity.

Computational analysis suggested that multiple hydrogen bonds and dispersive interactions between the ligand and substrates contribute to stabilization of the transition states to increase the reactivity and stereoselectivity.



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