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Catalyst-controlled regiodivergent vinylogous *aza*-Morita-Baylis-Hillman reactions

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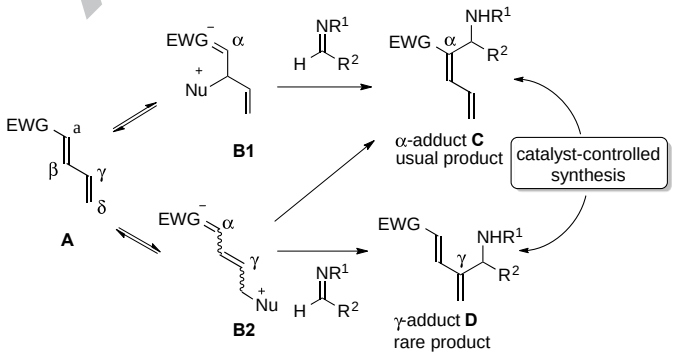
ABSTRACT

Regiodivergent vinylogous *aza*-Morita-Baylis-Hillman reactions of 3-vinylcyclopent-2-en-1-one **1** were developed in a catalyst-controlled manner. While treatment of **1** with *N*-tosylarylaldimines **2** in the presence of DABCO gave the α-adducts as the sole regioisomer, that in the presence of DMAP gave the unusual γ-adducts in 87-96% regioselectivity.

1. Introduction

The *aza*-Morita-Baylis-Hillman (*aza*-MBH) reaction is an effective carbon-carbon bond-forming reaction between electron-deficient alkenes and aldimines to give the corresponding allylamines.[1] For the construction of further funtionalized allylamine derivatives, an advanced version of *aza*-MBH reactions has been developed using conjugated dienes with electron-withdrawing groups such as sulfonyl,[2a] acyl,[2b] ester,[2c] and nitrile[2d] groups. The domino cyclization in combination with *aza*-MBH reactions of the conjugated dienes has been also reporeted.[2e,2f] While the *aza*-MBH reaction using activated conjugated diene **A** can potentially provide both α-adduct **C** and γ-adduct **D**, it actually affords α-adduct **C** in most cases (Scheme 1). In order to obtain γ-adduct **D** selectively, two critical steps should be controlled: (1) addition of the nucleophilic catalyst selectively at the δ-position to give intermediate **B2**, and (2) C-C bond formation selectively at the γ-position of dienolate **B2**. Here we report regiodivergent synthesis of the α- and γ-adducts of the *aza*-MBH reaction in a catalyst-controlled manner. The present method would afford multifunctionalized building blocks **C** and **D** possessing three electrophilic centers (conjugated diene with electron withdrawing group) and a nucleophilic center (protected amino group). To the best of our knowledge, this is the first example of the γ-selective *aza*-MBH reaction of conjugated dienes.[3,4]



Scheme 1. *aza*-MBH reaction of activated conjugated dienes **A**.

2. Result and discussion

We chose 3-vinylcyclopent-2-en-1-one **1** (Table 1) as a substrate because the expected *aza*-MBH adducts has maltifunctionalized components with potential utility for the construction of biologically active compounds consisting of cyclopentenone or the corresponding redox units.[5] To obtain γ-adduct **D**, dienolate **B2** is the requisite intermediate, which is supposed to be generated by usually unfavorable 1,6-addition of a nucleophilic catalyst to activated conjugated diene **A**.[6,7] However, 1,6-addition was expected to be favorable than 1,4-addition in the reaction of **1** because of the better steric accessibility at the δ-position.[8] We expected that the reacting site of dienolate **B2** with an electrophilic imine would be controllable by tuning its reactivity by employing the proper nucleophilic catalyst.[9] Based on this hypothesis, screening of nucleophilic catalysts for the vinylogous *aza*-MBH reaction of **1** was examined (Table 1).

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