

Title: An Approach to the Synthesis of Fragrance Ingredients: Brønsted Acid Catalyzed Enantioselective Diels–Alder Reaction of α,β - and β,β -Disubstituted Enones

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Abstract

Despite its 98-year history, certain variants of the Diels–Alder reaction remain unexplored in an enantioselective context. One such example has been the cycloaddition of disubstituted acyclic enones (α,β -unsaturated ketones) with hydrocarbon dienes, which had not been achieved enantioselectively prior to this work. By employing a strategy based on strong, chiral, confined Brønsted acids, we successfully accomplished this challenging transformation, thereby establishing the foundation for a general Diels–Alder methodology. The developed approach is characterized by broad generality and high enantioselectivity. Moreover, the products predominantly consist of terpenoid-inspired aliphatic compounds featuring structural motifs commonly found across terpenoids used in fragrance industry as well as in natural products of *Euphorbia* species. In addition, the method provides the shortest and most atom economic access to valuable fragrance ingredients such as arborone and damascones. The mechanism of the Diels–Alder reaction was investigated in detail. The study was further extended through attempts to apply this strategy to the synthesis of other fragrance molecules – ionones and irones – and alternative synthetic routes to these targets were also explored. Finally, novel methodologies for the preparation of catalysts and starting materials have been developed.