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Total Facial Selectivity in $2\pi+4\pi$ Reactions of (2*R*,4*S*,5*R*)-4-((*E*)-((4-Methoxyphenyl)imino)methyl)-2-phenyl-1,3-dioxan-5-ol to Electron-rich Dienophiles

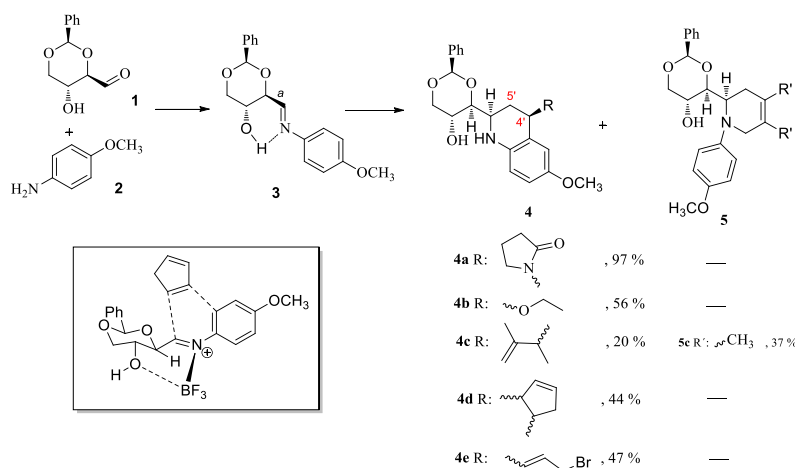
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Tetrahydroquinoline (THQ) is an important structural unit present in various natural products and pharmaceutical agents having a large range of biological activities. Many approaches have been developed for the construction of THQ scaffold. Among these, the inverse electron demand hetero-Diels-Alder reaction¹ or its ionic version² is regarded as a powerful tool. The imine **3** is generated *in situ* from *D*-erythrose and *p*-methoxy-aniline. When the reaction is finished dienophiles were added at $-78\text{ }^{\circ}\text{C}$ giving products in moderate to high yields, with formation of a single diastereoisomer.

In this work $\text{BF}_3\cdot\text{Et}_2\text{O}^3$ used as catalyst is supposed to help to induce facial selectivity in $2\pi+4\pi$ reactions. The boron atom is able to form a bridge between the oxygen and nitrogen atoms, neighbor in space. In this way rotation around bound **a** would be avoided, and the structure would obtain some rigidity. According to X-ray crystallography of product **4a**, dienophiles approach the imine by the *re* face. It is likely that the packing of the dienophile hydrogens with diene's H-4 explains the *si* face impediment. Reactions of the imine with vinyl ether and (*E*)-5-bromopenta-1,3-diene occurred in the absence of catalyst, but a single product was also formed. This was rationalized by an intramolecular hydrogen bond between the alcohol and the nitrogen atom that would confer to the structure the same rotational restriction. When 2,3-dimethylbutadiene was used as dienophile a mixture of inverse and normal polarity $2\pi+4\pi$ reaction product occurred in a 1:2 ratio.



Scheme 1.

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