

# Captodative olefins: methyl 2-aryloxy-3-dimethylaminopropenoates and their application in a new synthesis of benzofurans

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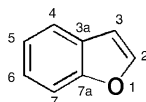
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Received 19 December 2003; revised 15 January 2004; accepted 16 January 2004

**Abstract**—The  $\beta$ -substituted captodative olefins methyl 2-aryloxy-3-dimethylaminopropenoates **4a–h** were synthesized, via aminomethylenation of the corresponding 2-phenoxyacetic esters **9a–h**. Lewis acid promoted intramolecular cyclization of alkenes **4** led to benzofurans **7a–h**, in an efficient synthetic approach to the benzofuran frame.

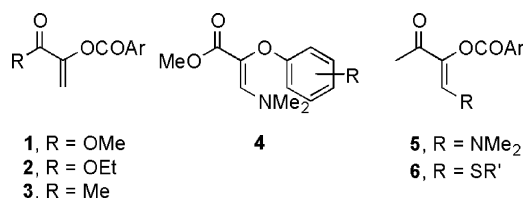
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Benzofurans have attracted widespread interest in view of their biological activity,<sup>1</sup> their presence in a large number of natural products,<sup>2</sup> and their potential as pharmacological agents.<sup>3</sup> Consequently, diverse synthetic strategies have been developed to build their fused skeleton, commonly starting from a benzene ring with the appropriate substituents. A large number of syntheses of the heterocyclic moiety are based on the formation of the O–C<sub>2</sub><sup>4</sup> or the C<sub>2</sub>–C<sub>3</sub> bonds,<sup>5</sup> as the ring closure step.<sup>1</sup> However, those strategies involving C<sub>3</sub>–C<sub>3a</sub> bond formation, by intramolecular cyclization of a properly functionalized precursor, have been particularly used as an attractive and versatile approach.<sup>1,6</sup>



Recently we reported the preparation of the new captodative olefins **1** and **2**, which bear the acrylic acid frame.<sup>7</sup> These alkenes were designed to mimic the structural features of the very reactive and selective

captodative olefins **3**.<sup>8</sup> Thus, both kinds of compounds hold the same electron-donating group but a different electron-withdrawing group. It was found that derivatives **1** and **2** were less reactive and selective than alkenes **3** as dienophiles in Diels–Alder reactions. FMO calculations suggested that the electron-withdrawing group controls the reactivity, and that the higher reactivity of **3** is determined by its less energetic LUMO.<sup>9</sup>



With the aim of evaluating the effect of the electron-donating group on the reactivity of the double bond, we carried out the synthesis of alkenes **4**. The acrylic skeleton in this case is analogous to that found in **1** and **2**, but with an aryloxy group attached to the double bond as the electron-releasing group. The dimethylamino group in the beta position is expected to decrease the reactivity of these dienophiles in Diels–Alder reactions, in agreement with the behavior of alkenes **5**,<sup>10</sup> which are enamines with a high synthetic potential.<sup>11</sup> However, the dimethylamino group promotes conjugate addition of nucleophiles such as thiolates to alkenes **5**, leading to

**Keywords:** Captodative olefins; 2-Aryloxy-3-dimethylaminopropenoates; Benzofurans; Cyclization; Lewis acid catalysis.

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