

# A one-pot synthesis of 3-arylglutaric anhydrides by reaction of ketene with aromatic aldehydes and ketones

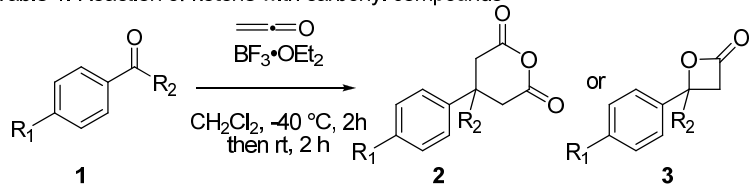
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I have found that ketene reacts with aromatic carbonyl compounds **1** to give 3-substituted glutaric anhydrides **2** or  $\beta$ -lactones **3**. Thus, the mechanism, scope and limitation of this new reaction of ketene to produce **2** were studied.

The reaction of ketene with aromatic carbonyl compounds was conducted under  $\text{BF}_3$  etherate catalyst (10 mol%) at  $-40^\circ\text{C}$ , and the representative results are summarized in Table 1. The result indicates that carbonyl compounds without electron-withdrawing

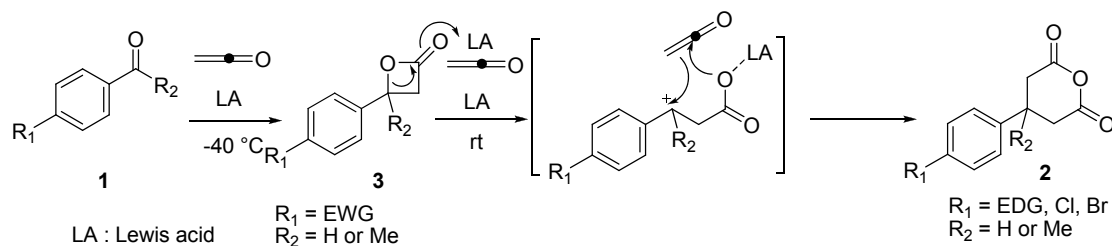
Table 1. Reaction of ketene with carbonyl compounds



entry	R <sub>1</sub>	R <sub>2</sub>	product			
			No.	yield (%)	No.	yield (%)
1	H	H	<b>2a</b>	31	-	-
2	OMe	H	<b>2b</b>	50	-	-
3	Cl	H	<b>2c</b>	39	-	-
4	Br	H	<b>2d</b>	61	-	-
5	CN	H	-	-	<b>3e</b>	86
6	NO <sub>2</sub>	H	-	-	<b>3f</b>	82
7	H	Me	<b>2g</b>	40	-	-
8	OMe	Me	<b>2h</b>	42	-	-
9	Me	Me	<b>2i</b>	55	-	-
10	NO <sub>2</sub>	Me	-	-	<b>3j</b>	71

substituent generally produce the corresponding glutaric anhydrides **2**, while those with strongly electron-withdrawing substituent produce  $\beta$ -lactones **3**.

The mechanism of this new reaction of ketene is illustrated in Scheme 1. The reaction of lactone **3c** with 3 equivalent of ketene under  $\text{BF}_3$  etherate catalyst (10 mol%) afforded the glutaric anhydride **2c** in 46% yield, clearly showing the intermediary of  $\beta$ -lactones for 3-substituted glutaric anhydrides **2**.



Scheme 1

R<sub>1</sub> = EDG, Cl, Br  
R<sub>2</sub> = H or Me