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Ionic liquid promoted interrupted Feist–Benary reaction with high diastereoselectivity

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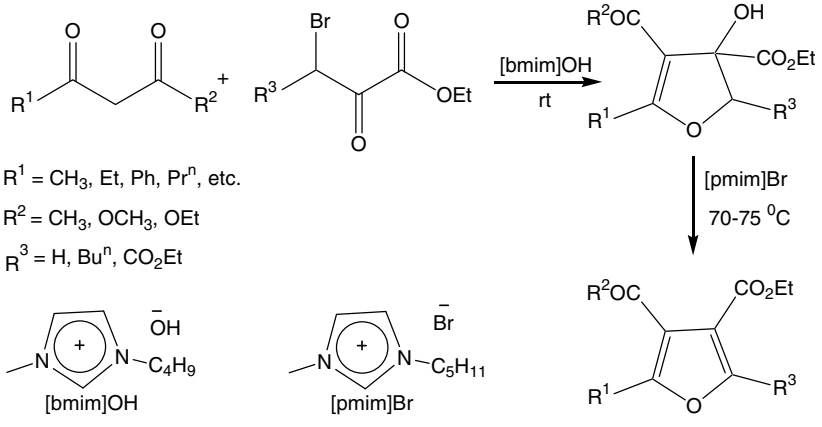
ABSTRACT

A basic ionic liquid, 1-butyl-3-methylimidazolium hydroxide promotes the interrupted Feist–Benary reaction at room temperature under organic solvent-free conditions to produce a variety of substituted hydroxydihydrofurans. The hydroxydihydrofurans are converted to furans (Feist–Benary products) using the ionic liquid, 1-methyl-3-pentylimidazolium bromide at 70–75 °C. The reactions are very clean, high yielding and highly stereoselective.

The Feist–Benary (FB) reaction, discovered over a century ago,[1] is a very useful reaction for the construction of highly substituted furan derivatives via condensation of β-dicarbonyl compounds with α-haloketones in the presence of a base. If this reaction is stopped at the hydroxydihydrofuran stage using a milder base, it is called the 'Interrupted Feist–Benary' (IFB) reaction. The IFB reaction is important for an easy access to substituted dihydrofurans which are constituents of many natural products arising from plants and marine organisms with promising biological activities.[2] However, only a limited number of methods are available for FB and IFB reactions.[3]

Ionic liquids have been the subject of considerable interest because of their roles as 'green' reaction media[4] and efficient catalysts.[5] As a part of our continuing programme to explore ionic liquid promoted novel reactions,[6] we discovered that a basic ionic liquid, 1-butyl-3-methylimidazolium hydroxide, [bmim]OH



Scheme 1.

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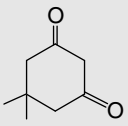
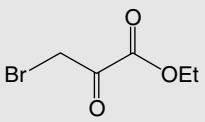
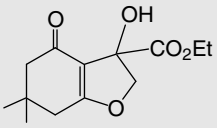
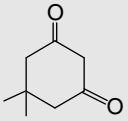
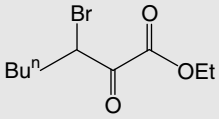
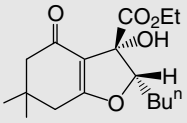
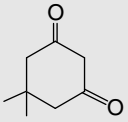
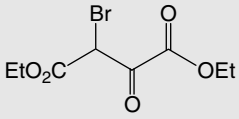
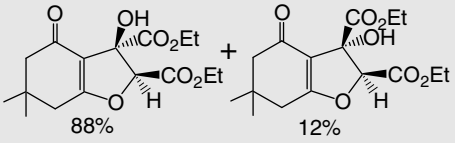
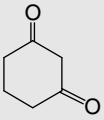
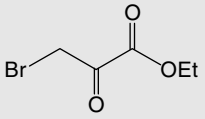
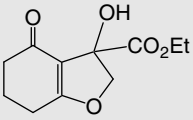
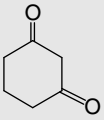
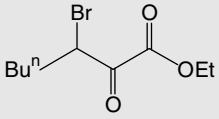
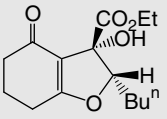
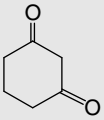
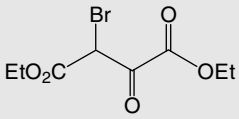
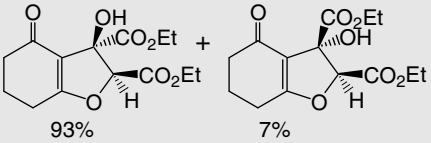
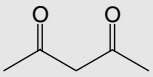
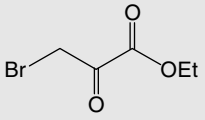
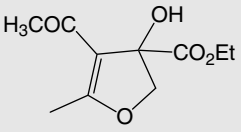
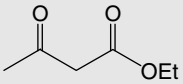
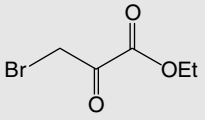
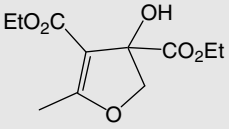
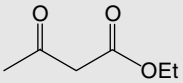
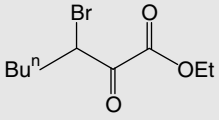
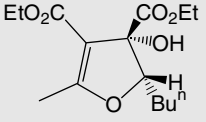
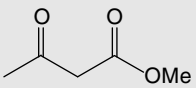
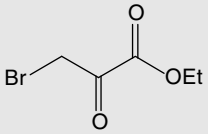
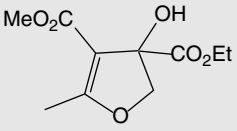
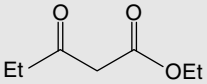
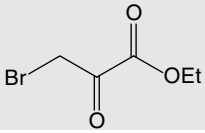
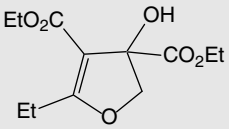
Table 1
Synthesis of hydroxydihydrofurans catalyzed by the basic ionic liquid [bmim]OH

Entry	1,3-Dicarbonyl compound	α-Bromoketone	Time (h)	Product	Yield[a] (%)	Ref.
1			0.5		90	
2			2.0		82	
3			4.0		70	
4			0.5		88	3f
5			1.5		78	
6			4.0		68	
7			0.5		85	3e
8			1.5		80	
9			3.0		72	
10			1.5		78	
11			2.0		75	