Synthesis of chalcones using a small amount of DMF or [emim]N(CN)$_2$ under highly concentrated reactions

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Solvent-free reactions have a lot of economic and environmental advantages over conventional procedures since they do not use highly toxic organic solvents. However, it does not often react satisfactorily and resulted in low yields when reactants are solids.

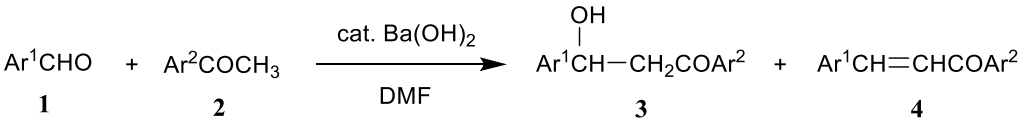
Highly concentrated reactions have many merits such as decreased solvent cost, reduced energy consumption, the frequent enhancement of reaction rates, and batch size reductions. Highly concentrated reactions are frequently applied to solvent-free reactions in order to dissolve solid reactants [1]. Owing to these advantages, much effort has been devoted to the development of highly concentrated reactions.

In this report, we wish to report that 10 mol% of Ba(OH)$_2$-catalyzed reactions between benzaldehydes **1** and acetophenones **2** were highly accelerated to give chalcones **4** without the formation of *β*-hydroxy ketones **3** in most cases when a small amount of DMF or [emim]N(CN)$_2$ was added under highly concentrated conditions.

First, we searched the most suitable solvent for the synthesis of chalcone (**4a**) under highly concentrated conditions. Benzaldehyde (**1a**) and acetophenone (**2a**) were treated with 10 mol% of anhydrous Ba(OH)$_2$ in the presence of 0.13 mL of the solvent at room temperature using a mortar and pestle. Chalcone **4a** was obtained accompanied by the formation of *β*-hydroxy ketone **3a**. Polar solvents such as DMSO and DMF gave higher yields of **4a**. Especially, DMF afforded the best result. The addition of 0.26 mL of DMF increased the yields of **4a**. We examined the synthesis of a variety of chalcones **4**. In most cases, the yields of **4** increased by the addition of DMF.

Furthermore, the synthesis of **4a** using several ionic liquids was attempted. Chalcone **4a** was obtained in higher yields than that of neat conditions in most cases. Higher yields of **4a** were obtained in the use of more polar ionic liquids. Especially, much more polar [emim]N(CN)$_2$ gave the higher yield than that of DMF. The reactions between various **1** and **2** proceeded faster than those of DMF when [emim]N(CN)$_2$ was added.

In conclusion, we showed the usefulness of highly concentrated reactions for the synthesis of chalcones.



1 **2** **3** **4**

[1] K. Tanemura, *Tetrahedron Lett*. (2021) 153391.