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Review on Synthesis in Deep Eutectic Solvents

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Abstract: *The synthesis of heterocycles is a fundamental area of organic chemistry that offers enormous potential for the discovery of new products with important applications in our daily life such as pharmaceuticals, agrochemicals, flavors, dyes, and, more generally, engineered materials with innovative properties. As heterocyclic compounds find application across multiple industries and are prepared in very large quantities, the development of sustainable approaches for their synthesis has become a crucial objective for contemporary green chemistry committed to reducing the environmental impact of chemical processes. This review focuses on the application of DESs in materials synthesis. After a brief summary of their use in organic synthesis, four strategies for materials synthesis are surveyed*

Keywords: Heterocyclic synthesis; deep eutectic solvents; H-bond catalysis , nano composite, eco-friendly, biocomposite

I. INTRODUCTION

An organic transformation in deep eutectic solvents is prominent field in synthesis of the novel heterocyclic compounds. DES basically used in the addition reactions among Michael addition is one of the most common methods to build a C-C bond, C-N bond, C-S bond andso on 28 In 2014, Azizi et al disclosed an atom-economic and odorless protocol for carbon–sulfur bond formation via the one-pot reaction of alkylhalides (1), thiourea (2), and electron deficient olefins (3) usingChCl/urea deep eutectic solvent as both the reaction medium and catalyst.

Thia-Michael addition in ChCl/urea.In 2014, Krishnakumar and co-workers have discovered a novel and green protocol for the Michael addition of *N*aryl homophthalimides (**5**) and chalcones (**6**) in *L*-(+)-tartaric acid/DMU low-meltingmixture.30 In order to optimize the reaction condition, a series of catalyst-solvent systems and various melt conditions were investigated. The results indicated that *L*-(+)-tartaric acid/1,3-dimethylurea (DMU) mixturewas the most effective reaction medium. Based on the acidity of the melt, the authors suggested a reactionmechanism as shown in Scheme 4. First, the ability of the acidic low-melting mixture to hydrogen-bondplays an important role for activation of the C3 carbonyl group of *N*-arylhomophthalimide (**5**) to form theintermediate **A**. Next, the presence of intermolecular hydrogen bonding provides additional attractiveforces between molecules. The low-melting mixture also might assist in improving the reactivity ofchalcone. The formed *in situ* intermediate **A** attacks the chalcone (**6**) to form intermediate **C**. In a final step,the product **7** was obtained and the melt was utilized for further reaction.

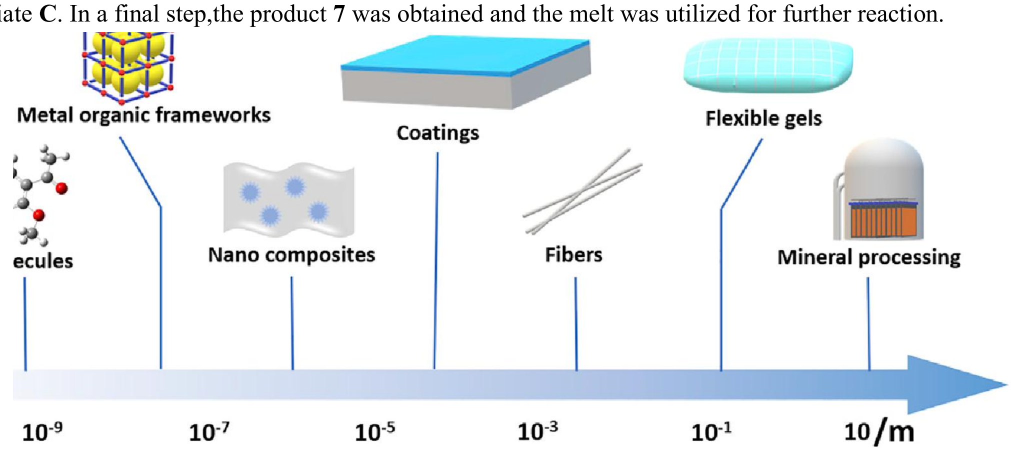
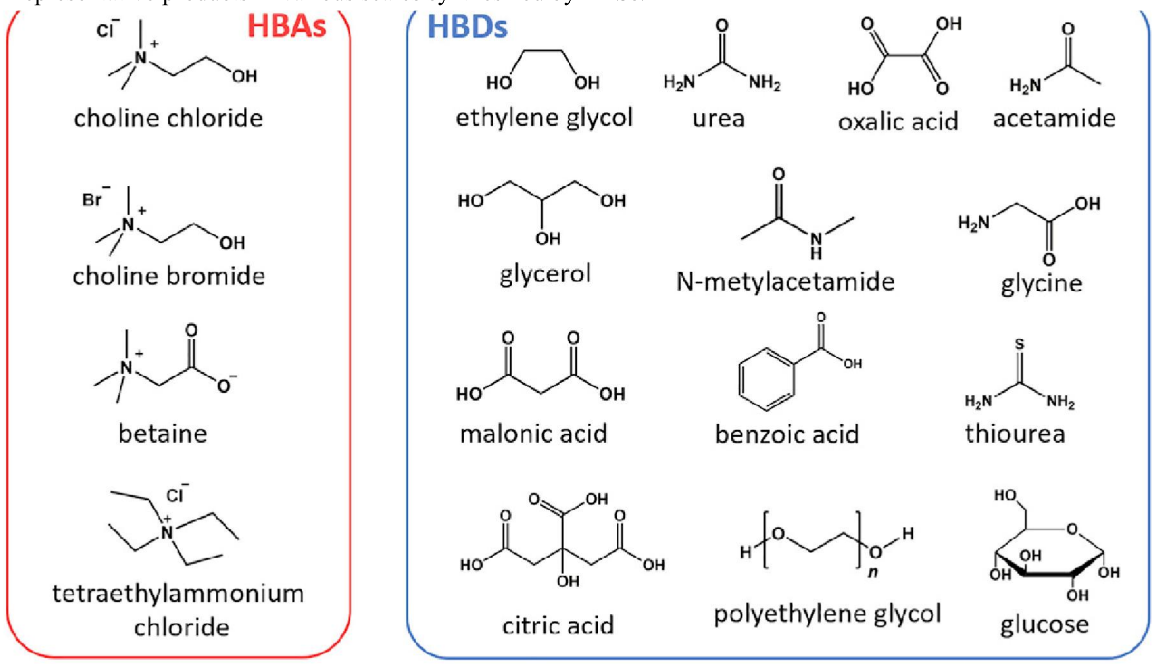


Figure 1. DESs and products synthesized in them

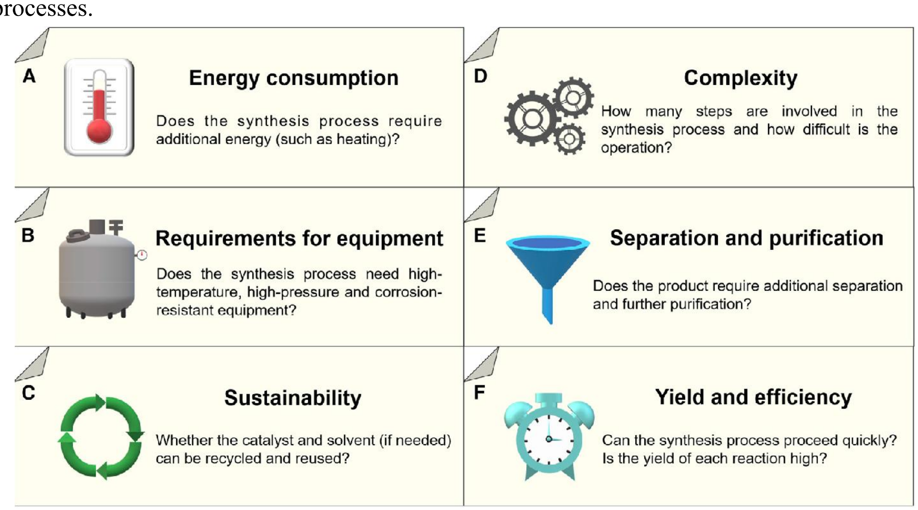
(A) Examples of typical hydrogen bond donors and acceptors used for forming DESs.
(B) Representative products in various scales synthesized by DESs.



Properties of DES

In addition, DESs possess their unique properties, making their applications beyond aqueous systems. Urea and other carbon-containing organic components can be regarded as good carbon sources, so DESs can be directly calcined to prepare graphene or carbon nitride-based 2D materials.10 Compared with directly calcining the precursor solid, the products made by DESs are more uniform.

DESs theoretically belong to a class of protic solvents.However, the presence of ionic regions in DESs allows the local polarity toreach the level of ionic compounds. Therefore, they cannot be simply classifiedinto any conventional solvents.In addition, light and microwave can be combined with the solvothermal methodwhen preparingmaterials.56–58 These combinations not only enrich the solvothermalmethodology in DESs but also improve the efficiency of the synthesizing processes.



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II. CONCLUSION

In conclusion, the success ofsome electrodeposition plants suggests it is themost promisingprocess for industrial application.Green chemistry emphasizes that the solvent should be a safe, non-toxic, green, readily available,cheap, recyclable and biodegradable. Deep eutectic solvents' properties, such as low price, chemicalinertness with water, easy to prepare, tuneable physicochemical properties, high thermal stability, andbiocompatible, meet these requirements. In this review, we highlighted the up-to-date progress inemploying DESs as green solvent and/or catalyst in organic reactions

REFERENCES

[1]. Hansen, B.B., Spittle, S., Chen, B., Poe, D., Zhang, Y., Klein, J.M., Horton, A., Adhikari, L., Zelovich, T., Doherty, B.W., et al. (2021). Deep eutectic solvents: a review of fundamentals and applications. Chem. Rev. 121, 1232–1285.

[2]. Luo, Y., Ma, H., Zhang, S., Zheng, D., Che, P., Liu, X., Zhang, M., Gao, J., and Xu, J. (2020). Binding energy as driving force for controllable reconstruction of hydrogen bonds with molecular scissors. J. Am. Chem. Soc. 142, 6085–6092.

[3]. *(a)* Y. L. Gu, *Green Chem.*, 2012, **14**, 2091-2128; (b) M. C. Bubalo, S. Vidović, I. R. Redovniković and S. Jokić, *J. Chem. Technol. Biotechnol.*, 2015, **90**, DOI: 10.1002/jctb.4668.

[4]. *(a)* T. Y. Cheng, D. C. Zhang, H. X. Li and G. H. Liu, *Green Chem.*, 2014, **16**, 3401-3427; *(b)* A. K. Rathi, M. B. Gawande, R. Zboril and R. S. Varma, *Coord. Chem. Rev.*, 2015, **291**, 68-94.

[5]. Y. Medina-Gonzalez, S. Camy and J. S. Condoret, *ACS Sustainable Chem. Eng.*, 2014, **2**, 2623-2636

[6]. Thorat, G.M., Jadhav, H.S., Roy, A., Chung, W.-J., and Seo, J.G. (2018). Dual role of deep eutectic solvent as a solvent and template for the synthesis of octahedral cobalt vanadate for an oxygen evolution reaction. ACS Sustain. Chem. Eng. 6, 16255–16266

[7]. Gupta, R., Gamare, J., Sahu, M., Pandey, K., and Gupta, S.K. (2021). Electrochemical and thermodynamic insights on actinide type (IV)deep eutectic solvent. J. Mol. Liq. 329,115550.