

Design of natural deep eutectic solvents for application in absorption heat pumps

Topic suitable for Master Thesis

Absorption heat pumps (AHP) commonly use water and lithium bromide (LiBr) as working media; LiBr acts as absorbent. However, at higher temperatures LiBr solutions reduce the performance of AHP and result in equipment damage due to corrosion and crystallization; this reduces the profitability of AHP. Deep eutectic solvents (DES) are alternative absorption media and might be able to replace LiBr as absorbent for water. DES are mixtures of two compounds which interact with each other (e.g. through hydrogen bonding) and lead to a melting point depression as shown in Figure 1. When compared to LiBr, DES have several advantages, such as simple and cheap production, environmentally friendly, and they can be produced from renewable raw materials.

In the first part of this work, a basic approach for the design of natural DES with task specific properties (in this case requirements for the application in AHP) shall be developed. In the second part, the DES shall be produced on lab-scale and characterized using different analytical methods, such as Karl-Fischer titration, thermogravimetric analysis (TGA), nuclear magnetic resonance spectroscopy (NMR), density measurements, and viscosity measurements. Furthermore, the maximum water absorbance at atmospheric pressure shall be investigated with simple shaking experiments. Finally, the most promising DES shall be selected for water absorption and desorption experiments at different temperatures and pressures.

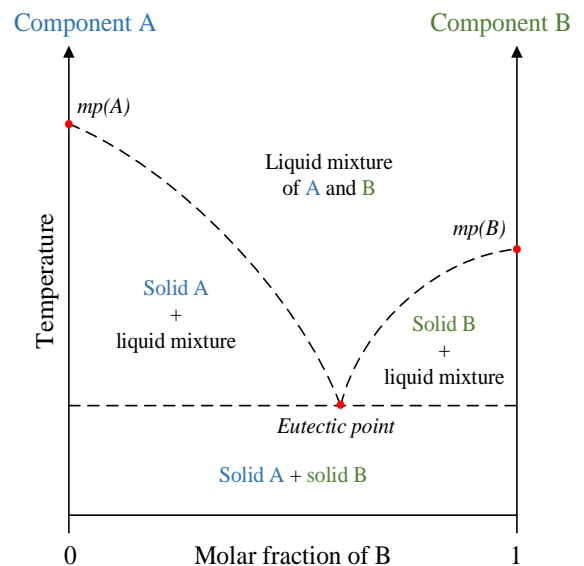


Figure 1: Phase diagram of a DES

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