

Working Fluids in Absorption Chillers: Investigation of the Use of Deep Eutectic Solvents

Authors : L. Cesari, D. Alonso, F. Mutelet

Abstract : The interest in cold production has been on the increase in absorption chillers for many years. In fact, the absorption cycles replace the compressor and thus reduce electrical consumption. The devices also allow waste heat generated through industrial activities to be recovered and cooled to a moderate temperature in accordance with regulatory guidelines. Many working fluids were investigated but could not compete with the commonly used {H₂O + LiBr} and {H₂O + NH₃} to author's best knowledge. Yet, the corrosion, toxicity and crystallization phenomena of these mixtures prevent the development of the absorption technology. This work investigates the possible use of a glyceline deep eutectic solvent (DES) and CO₂ as working fluid in an absorption chiller. To do so, good knowledge of the mixtures is required. Experimental measurements (vapor-liquid equilibria, density, and heat capacity) were performed to complete the data lacking in the literature. The performance of the mixtures was quantified by the calculation of the coefficient of performance (COP). The results show that working fluids containing DES + CO₂ are an interesting alternative and lead to different trails of working mixtures for absorption and chiller.

Keywords : absorption devices, deep eutectic solvent, energy valorization, experimental data, simulation

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