**A mixture model explicit in the reduced Helmholtz energy for the binary mixture ethanol + carbon dioxide**

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The accurate knowledge of thermodynamic properties is important for designing and optimization of many processes in chemical, power, and process engineering. Multiparameter equations of state explicit in the reduced Helmholtz energy (Helmholtz equations of state) are the most accurate source of thermodynamic property data available [1]. Consequently, this type of equation of state is the best choice if property data in high accuracy are required.

In this work, the binary mixture ethanol + carbon dioxide was studied. On the one hand, ethanol can be used as gas hydrate inhibitor, i.e. it could be added to water-containing carbon dioxide that is transported in a pipeline in order to shift the hydrate formation temperature to lower values. On the other hand, the utilization of the binary mixture ethanol + carbon dioxide as cooling fluid is currently under consideration.

The fluid phases of ethanol are well described by the equation of state by Schroeder *et al.* [2] and for the fluid phases of carbon dioxide a reference equation by Span and Wagner [3] exists. Kunz and Wagner [4] developed mixing rules based on a multi-fluid approximation in order to model mixtures with Helmholtz equations of state. These mixing rules contain parameters which need to be fitted to experimental data for the binary mixture. Mixing rules for many components became available over the last years. Especially typical natural gas components and the main components of carbon capture and storage-relevant mixtures are already well described. However, no mixing parameters for the binary mixture of carbon dioxide + ethanol exist.

Experimental data for the binary system of ethanol + carbon dioxide have been collected and analyzed in this work. Preliminary results for the new mixture model will be shown and compared to other models.

References

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