# New Density Data and Equations of State Assessment for CO2-Based Mixtures at Conditions Relevant to CO2 Transport for the CO2 Capture and Storage Chain

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The density of $CO_2$-rich mixtures is one of the key thermophysical properties required for the design and operation of the CCUS ($CO_2$ Capture, Utilization and Storage) chain, including the $CO_2$ transport step, since it is crucial for sizing the $CO_2$ transport networks, simulating $CO_2$ pipelines and assessing flow assurance. Although several projects have been trying to fill the experimental and modeling gaps, for proper thermophysical properties characterization, new density data are still required for some selected binary pairs, as well as for multicomponent $CO_2$-based mixtures [1].

In this work, experimental tests on densities targeting not only binary or ternary blends, but also more realistic multicomponent mixtures of $CO_2$ from different capture routes (e.g., pre-combustion) are performed; impurities such as $CH_4$, $H_2$, $N_2$ and CO are considered, with particular attention to $H_2$ due to its major impact on bubble point shifting. Very limited datasets exist in the literature for densities of such $CO_2$ systems at conditions relevant to $CO_2$ transport, either in the gas or liquid phase [2]. Newly generated density data produced with a Vibrating Tube Densimeter (with gravimetrically prepared mixture samples) are then used for the accuracy assessment of equations of state for CCS. The EOS models compared are: (i) multiparameter GERG-2008 and EOS-CG; (ii) two Peng-Robinson cubic formulations with different mixing rules; (iii) the PC-SAFT model. The presentation will cover both the new density measurements and results from the EOS assessment, including relevant data from the literature.

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**References**

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