Viscosity of CO_2-rich mixtures at relevant condition for Carbon Capture and Storage (CCS)

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Thermophysical properties of CO_2 rich mixtures play an important role in CO_2 transportation and storage. Carbon Capture and Storage (CCS) processes simulations for design and operation as well as safety and environmental assessments require accurate predictions of thermophysical properties of impure CO_2 stream. CCS processes cover a large range of operation conditions and involve multiple impurities. Impurities have significant impact on thermophysical properties such as viscosity. The experimental data on viscosity of CO_2 rich mixtures are very limited and established models correspondingly have large uncertainties. In the current research work, the need for new data is addressed through accurate measurements of viscosity using a rotating body viscometer in the thermodynamic laboratory of Ruhr University Bochum, Germany. The aim of this work is to produce new experimental data for the two different binary mixtures: (carbon dioxide + nitrogen) and (carbon dioxide + hydrogen) mixtures over the temperature range from 253.15 to 473.15 K with pressures up to 15 MPa. In order to correct geometry effects of the concentric cylindrical system inside the measuring cell, helium is used as a reference fluid by comparing measured viscosity data to accurate values calculated *ab initio*. For the binary gas mixtures, the relative expanded combined uncertainty in viscosity is between 0.4% at pressures up to 2 MPa and 0.7% at higher pressures.