

Combined Viscosity and Density Measurements of Carbon Dioxide in the Temperature Range from 253 K to 473 K at Pressures up to 17 MPa

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Combined viscosity and density measurements of carbon dioxide have been carried out in a temperature range from 253 K to 473 K at pressures up to 17 MPa using an absolute viscometer-densimeter incorporating a magnetic suspension coupling. Viscosity and density values have been measured in the vapor phase and at supercritical states. The expanded uncertainty ($k = 2$) in viscosity is 0.15 % for the low-density vapor phase increasing to 0.4 % for higher densities. The expanded uncertainty ($k = 2$) in density is 0.1 % in the entire temperature and pressure range. To check the consistency of the viscosity measurements a smaller uncertainty in viscosity of less than 0.07 % ($k = 2$) is achieved with a second viscometer used up to 2 MPa. For both viscometers the principle of the rotating-cylinder is utilized. In the viscometer-densimeter this particular principle is applied together with the single-sinker densimeter technique in the same measuring cell. The new data will be used to develop more accurate viscosity models for carbon dioxide. Beside their scientific relevance such models are important for the process industry developing new technologies with carbon dioxide, particularly within the field of carbon dioxide capture and storage (CCS).