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Capillary pressure experiments under simulated reservoir conditions

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The contribution of residual trapping to a long-term storage of CO_2 in saline aquifers mainly depends on the drainage capillary pressure of a reservoir and the hysteresis of the drainage and imbibition branches of the capillary pressure curve. However, the experimental database of capillary pressure measured at relevant pT conditions is still scarce.
Here, we present an experimental set-up, which allows for the performance of capillary pressure experiments with a semi-permeable disk (porous plate) at simulated reservoir conditions. In the framework of the EU funded project CO_2CARE, drainage and imbibition cycles are performed on Triassic sandstone samples. We use a temperature controlled oil pressure autoclave to apply a maximum confining pressure of 400 bar and a maximum working temperature of 150°C. The fluid displacement, and hence the sample saturation is controlled by a gear pump with a fine resolution of 0.01 ml. Additionally, the capillary pressure experiment is combined with measurements of elastic wave velocities as well as of the electrical resistivity. In this case, P and S wave velocities and the formation resistivity factor are determined as functions of the brine/ CO_2 saturation. The experiment provides information about the efficiency of the capillary trapping of the sample and a calibration of the petrophysical properties on saturation.