Contribution ID: **252** Type: **Poster (+) Presentation**

Gas shale swelling and shrinkage characterized by controlled suction experiments

Tuesday, 1 June 2021 10:00 (1 hour)

Gas shales are partially water saturated with their pore space simultaneously filled with brine and liquid and/or gas hydrocarbons. Changes in water saturation can cause swelling or shrinkage, which is of significant importance to natural gas production from unconventional shale reservoirs and sample handling in the laboratory [1]. During hydraulic fracturing, a substantial amount of injected water-based fluid is believed to imbibe into the shale matrix, driven by the high suction gradient between the well and the shale. Such imbibition has been evidenced in the field by large fluid loss during flowback operations and reproduced by many laboratory spontaneous imbibition tests [2], [3]. Also highlighted in recent research is that increasing water saturation can not only result in swelling [4] but also alter elastic and strength properties [5]. However, little is know about how suction and water saturation can be related to the resulting volumetric deformation in gas shales. Here we show our progress in characterizing the swelling and shrinkage of gas shales as stress-strain behavior. We found, in our controlled suction experiments on an organic-rich shale, that the volumetric strain induced by suction variations is a strong function of imposed suction and water saturation. The non-linear hysteretic relationship between the two was expressed by water retention curves. We discuss possible expressions for the average pore pressure and effective stress. We anticipate our results to be a starting point for a more sophisticated stress-strain framework with a proper definition of effective stress for partially saturated gas shales.

Time Block Preference

Time Block A (09:00-12:00 CET)

References

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