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Modelling of Modified Salinity Waterflooding: A Comparison between the Mechanistic and Empirical Models

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Water flooding is the most widely applied method of improved oil recovery. The majority of the studies show that lowering or modifying the salinity of the injected water seems to alter the wettability towards more water-wet conditions and increases the displacement efficiency of water-flooding. Different mechanistic and empirical models have been suggested to investigate the effect of modified-salinity water flooding on the production history and the ultimate oil recovery. In this study, we model a set of core flooding experiments on the Stevns Klint chalk samples using empirical models and compare the results with an in-house mechanistic model. We first obtain the relative permeability parameters by fitting (history-matching) a two-phase flow model to the reported core flooding recovery data in different formation brine and injection brine compositions. For the empirical group of models, we assume that salt is transported as a pseudo-component in the aqueous phase with/without adsorption on the rock, and we assume that the relative permeabilities are a function of the total salinity. The results show different saturation fronts when the adsorption is included in the model.