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Constitutive elasto-plastic models applied for representation of the geomechanical behaviour of travertine carbonate rock

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For a better prediction of petroleum reservoirs production behaviour during its exploitation, it is necessary to establish appropriate constitutive models to represent the mechanical and hydraulic behaviours of these materials. The present work aims to contribute in establishing appropriate models to represent the geomechanical behaviour of travertine carbonates. It is known that the strength of the carbonates is related to their complex pore structure, mineralogy and arrangement of the grains. The compaction of reservoirs is a consequence of changes in the state of stress which are able to produce elastic and plastic deformations, eventually leading to rock failure. During reservoir depletion, it can be observed that the occurrence of increase in effective stresses due to pore pressure reduction. This may lead to pore collapse followed by reservoir compaction. Carbonate rocks usually present an elasto-plastic behaviour of these rocks. It is believed that models such as Lade Kim and Cam Clay modified models can represent the geomechanical behaviour of travertines. Parameters for these models are seldom found in the literature for travertines, reason being that carefully performed laboratory tests in these materials must be carried out. As a part of the present work, laboratory tests have already been carried out in travertine samples, more tests will be performed. The tests include triaxial compression and extension, hydrostatic and uniaxial compression. The results of these tests are used to establish the parameters for constitutive models such as Lade Kim and modified Cam Clay. The results obtained so far indicates that these models are adequate to represent the geomechanical behaviour of travertines.

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