

A Robust Theoretical Elastoplastic Continuum Damage T-H-M Model for Rock Surrounding a Wellbore

Authors : Nikolaos Reppas, Yilin Gui, Ben Wetenhall, Colin Davie

Abstract : Injection of CO₂ inside wellbore can induce different kind of loadings that can lead to thermal, hydraulic, and mechanical changes on the surrounding rock. A dual-porosity theoretical constitutive model will be presented for the stability analysis of the wellbore during CO₂ injection. An elastoplastic damage response will be considered. A bounding yield surface will be presented considering damage effects on sandstone. The main target of the research paper is to present a theoretical constitutive model that can help industries to safely store CO₂ in geological rock formations and forecast any changes on the surrounding rock of the wellbore. The fully coupled elasto-plastic damage Thermo-Hydraulic-Mechanical theoretical model will be validated from existing experimental data for sandstone after simulating some scenarios by using FEM on MATLAB software.

Keywords : carbon capture and storage, rock mechanics, THM effects on rock, constitutive model

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