

A DEM simulation for the crack propagation in organic-rich shales during heating

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ABSTRACT

The coupling between chemical reactions and deformation in rocks can induce permanent damage and cracking that facilitate the circulation of fluids at large scale. This coupling process has been observed in various geological systems as weathering and erosion of rocks on the surface, hydration of the lower crust, sediment dehydration in subduction zones, serpentinization of oceanic crust or sediment rock.

Among the sedimentary rocks, shale has gained prominence due to growing unconventional exploitation of gas and oil. In this geological material, the coupling between organic matter maturation and the creation of micro-crack connectivity is one of the mechanisms proposed to explain the primary migration of hydrocarbons.

The aim of this work is to present a modelling of the micro-cracking process in organic-rich shales by the maturation of organic material. The hydro-mechanical version of the open source Discrete Element Method (DEM) code YADE is used to simulate the organic material dilatancy-induced cracking. The influence of the in-situ differential stress, as well as the density of organic patches on the fracture, is presented.

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