Geophysical Research Abstracts
Vol. 14, EGU2012-2973-1, 2012
EGU General Assembly 2012

Effect of flow rate and initial aperture on fractured cement plug subjected to CO_2

H. Abdoulghafour (1), L. Luquot (2), and P. Gouze (3)

(1) UM2, CNRS, Geosciences, Montpellier, France (halidi@gm.univ-montp2.fr, 33(0)467143642), (2) CSIC Barcelona, Spain(2), (3) UM2, CNRS, Geosciences, Montpellier, France

Effect of flow rate and initial aperture on fractured cement plugs subjected to CO_2 rich brine under geo-sequestration conditions

Abdoulghafour Halidi, Linda Luquot and Philippe Gouze

Laboratoire Géosciences Montpellier, UMR 5243, Montpellier, France (1,3), CSIC Barcelona, Spain(2)

Laboratory studies conducted on cement materials under CO_2 sequestration conditions, showed evidence of alteration due to CO_2 attack.Therefore cement alteration is controlled by hydrodynamic parameters and chemical processes.
In this study we present three percolation experiments conducted on fractured cement plugs using the same thermodynamic conditions (T = 60°C, P = 10MPa).Such experiment allow to simulate leakage limestone reservoirs.
Hydro-chemical processes were determined based on fluid flow velocity and initial fracture aperture. During experiment conducted on most opened fracture (a0 = 43μm), with high flow rate of 2ml/min and lasted 25h, in situ permeability remains constant for 18h exposure, then decreases to the end of experiment. Similar observation has been seen for experiment conducted on more or less closed fracture (a0$\sim$7μm), with very slow flow (0.05) where slow increase of permeability was recorded followed by progressive decrease from 13h to the end of experiment (28h). On the other hand, we performed short-term experiment lasted 6h on intermediate opened fracture (a0 = 27μm), using high flow rate of 2ml/min. Permeability change was recorded during the first hour experiment, then remains constant still the end of CO_2 exposure. Chemical analysis performed on outlet fluid match with permeability evolution as they showed the effect of flow rate on dissolution as well as precipitation.
From this data set we could evidence the determining role of local velocity of fluid renewal on reaction processes, leading to structures and hydrodynamic changes.
Presented results were reproduced using coupled reactive-transport model highlighting the important role of transport processes

Keywords: CO_2 sequestration, cement plug, flow rate, permeability, transport, chemical processes, reactive-transport model