Geophysical Research Abstracts
Vol. 20, EGU2018-8117, 2018
EGU General Assembly 2018

Fundamental investigation of the effect of local surface roughness on foam flow behaviour inside the fracture

Mohammad Javad Shojaei (1), Antonio Rodrıguez de Castro (2), and Nima Shokri (1)

(1) University of Manchester, University of Manchester, School of Chemical Engineering and Analytical Sciences, United Kingdom (mohammadjavad.shojaei@postgrad.manchester.ac.uk), (2) Arts et Metiers ParisTech, Chalons-en-Champagne, France

A significant portion of underground oil reservoirs are naturally fractured. The presence of fractures significantly influences the flow of fluids in porous media and displacement efficiency. Channelling and preferential flow path are the specific problems of interest within the field of gas flow through fractured media. The high viscosity and fluid diversion ability of foam offers great potential to resolve some of the major challenges associated with gas injection in porous media (1-3). In recent years, there has been a rising interest in experimental investigation of foam flow in fractured media with sophisticated imaging tools to delineate behaviour of foam inside the fracture (4-5). However, in majority of these studies the aperture map of the fracture is unknown and lacks clarity regarding to how local surface roughness of the fracture influence foam bubble size, foam front propagation, velocity map of the foam bubble, foam coalescence and the stability of foam inside the fracture. The specific objective of this work was to investigate the effect of local surface roughness of the fracture on foam flow behaviour. To elucidate this effect, a compressive series of experiments have been performed using pre-generated foam at different foam qualities of 98, 95, 90, 85, 80 and 75 flowing at the constant rate of 10 ml/min in a replica of a rough-walled rock fracture with well-characterized aperture map. The dynamics of flowing foam in fracture (filled with gas, water and oil) were recorded by means of a digital camera. Using the recorded images, we could quantify how the local surface roughness influences foam bubbles size, foam front and stability of foam bubble inside the fracture which ultimately influences foam sweep efficiency. The observed behaviours reveal the significant impact of local surface roughness on foam performance echoing the necessity to include this parameter when investigating fluid displacement by foam in fractured media.