Geophysical Research Abstracts
Vol. 20, EGU2018-16316-1, 2018
EGU General Assembly 2018

Textural and Diagenetic Controls on Pore Systems in the Cretaceous Eagle Ford Formation

Ilaria Gaiani (1), Andrew C. Aplin (1), and Ruarri J. Day-Stirrat (2)

(1) Durham University, Earth Sciences, Earth Sciences, United Kingdom (ilaria.gaiani@durham.ac.uk), (2) Shell International E&P Inc., USA, Houston, US

Quantifying the pore systems of fine-grained reservoirs is hugely challenging due not only to their extensive textural and mineralogical heterogeneity but also the sub-nanometer to micrometer size of pores. Definition of the reservoir storage and flow system, which underpins effective production, thus requires a very detailed, quantitative understanding of the porosity system and its relationship with rock texture. This work focuses on the Cretaceous Eagle Ford formation, an organic-rich marl that trends across Texas and which produces around 1 million barrels of oil and 4 bcf of gas per day. In order to understand the nature and evolution of the pore system, we have analysed a set of 46 samples from outcrops and six different wells with maturities of 0.4%, 0.8% and 1.2% Ro. XRD, transmitted and reflected light optical microscopy, EDX and SEM techniques have been used to reconstruct the mineralogical and textural framework in which the porosities occur. Carbonate contents range from 37 to 84% and TOC values from 0.5 to 7.9%. Petrographic studies show that the organic matter is mainly marine type II and that microfacies vary from finely laminated marls to fossiliferous limestones. The paragenesis of the samples, in particular the diagenesis of carbonate and the generation and micromigration of organic phases, has been determined with BSEM and SEM-EDX. MicroCT of mm-size cores, calibrated with high resolution FIB-SEM, has identified the occurrence and connectivity of the main textural domains (organic matter and porosity, microfossiliferous material, fine-grained argillaceous/carbonate matrix and pyrite), and the nature of the pore system in each domain. In the low maturity samples, the main porosity types are interparticle, enclosed within the argillaceous and coccolithic matrix, whereas in most of the mature samples the pores present a more spherical shape, suggesting that they are mainly situated within the migrated and in-situ OM. Pore systems have been characterised using a combination of high resolution SEM, mercury injection porosimetry and N2 and CO_2 sorption. Pore sizes, calculated by analysing and combining data between SEM images and gas adsorption, appear to have a bimodal distribution with modes around 10-20 nm and 50-200 nm. Current work, using ESEM, AFM and nano-IR, is focussed on understanding the chemical interaction between the fluids and pore surfaces.