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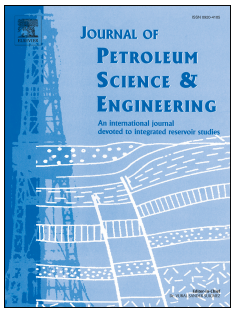

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Tight Chalk: Characterization of the 3D pore network by FIB-SEM, towards the understanding of fluid transport

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Abstract

Tight chalk intervals play a major role in North-Sea hydrocarbon fields, by controlling fluid flow pathways of hydrocarbon and water. Recent studies reveal that low-permeability chalk properties are dependent on clay content and cementation. Therefore, in this research, three characteristic samples were selected: (A) a porous micritic chalk, (B) a cemented chalk and (C) an argillaceous chalk. Focused Ion Beam-Scanning Electron Microscopy (FIB-SEM) analyses were performed and 3D pore networks were reconstructed for each sample. By using MATLAB® and Avizo® softwares, relevant pore data were extracted, including pore volumes, lengths and network tortuosity. Results show that the pore length is reduced in tight chalks, with 140 nm on average in argillaceous chalk and 533 nm in cemented chalk, compared to 1091 nm in micritic reservoir chalk. Pore shape analysis demonstrates that, when present, clay flakes are predominant. Argillaceous chalk displays 35% of flattened pores, while these represent only 15 and 18% of pores in micritic and cemented chalk respectively. Virtual rock porosity calculated from FIB-SEM is consistent with helium porosity lab-measurements. MICP pore-throat diameters also match calculated pore widths. These preliminary findings confirm the potential of FIB-SEM analyses in characterizing chalks porous media. In order to understand fluid