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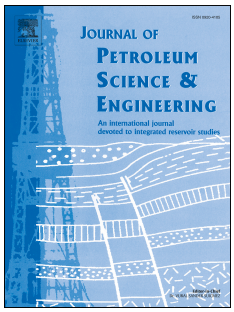

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Numerical Analysis of Carbon Dioxide Injection into a High Permeability Layer for CO_2-EOR Projects

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Abstract

Mature oilfields and aquifers are the most favorable targets for the CO_2 sequestration projects. In this work, the purpose is to investigate an alternative approach in which at very early stage of the oil production, combines CO_2-EOR and CO_2 sequestration up to the depletion of the oilfield, and analyze the relationship between EOR and CCS projects. Responding to the oil industry needs, initially was designed to investigate the potential to increase the oil recovery factor and the extent to which mobility overlaps the miscibility in reservoirs with low and high permeability layers, a situation which is similar to the pre-salt reservoirs. The process of CO_2 injection into oil reservoir is analyzed in different flooding scenarios that include: (i) continuous gas injection (CGI), (ii) constant water-alternating-gas (WAG) injection, and (iii) tapered WAG (TWAG) injection. Compositional numerical simulations were conducted to identify the good injection site in the reservoir and to optimize the injection strategies. Based on the observation, the results reveal that the oil recovery factor may be employed for indicating whoever overlaps, between mobility and miscibility, when a high permeability layer is present. A cradle-to-grave life cycle analysis was considered for estimating net CO_2 emissions in each of the CO_2-EOR operations. In regards to CCS, in the CGI, WAG and TWAG, simulation results indicate that the CO_2 stored represents around 28.77%, 14.49% and 13.24% of the CO_2 emissions, related to the oil produced due to the implementation of the EOR project, respectively.

Keywords: Compositional simulation; Miscible flooding; Mobility; High permeability; Oil recovery factor; Carbon storage evaluation.