

# A Flow and Transport Model in Porous Media for Microbial Enhanced Oil Recovery Studies Using COMSOL Multiphysics® Software

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## Abstract

A flow and transport model in porous media was implemented in COMSOL Multiphysics® software to simulate, analyze and interpret Microbial Enhanced Oil Recovery (MEOR) processes at core scale under laboratory conditions.

The flow model is biphasic and is based on the oil phase pressure and total velocity formulation in which the capillary pressure, relative permeabilities, the effects of gravity and the dynamic porosity and permeability modification, due to the clogging-declogging phenomena, are taken in account. Whereas, the transport model consists of three components (microorganisms, nutrients and bioproducts). It includes physical-chemical-biological phenomena such as advection, diffusion, dispersion, growth and decay of microorganisms.

From the methodological point of view, each stage of the model development (conceptual, mathematical, numerical and computational) is described. The model is numerically validated in a case study of oil displacement by the injection of water, followed by the injection of water with microorganisms and nutrients.

## Figures used in the abstract

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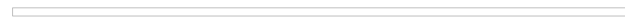
Figure 1

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Figure 2



**Figure 3**



**Figure 4**