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Keynote2

# New Insights on the Use of Polymer and/or Nanoparticles to Reinforce Foam for EOR Operations

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## Summary

No summary available.

## Introduction

Foam, which is defined as a dispersion of gas in a liquid containing surfactant, has been widely studied in bulk and in porous media. The main difference between those two situations is the close contact with the solid phase making the generation, stability and transport processes peculiar in porous media. Foam in porous media has several applications in petroleum engineering, stimulation, profile control and EOR. However, foam is known to be weakly resistant to oil and to have a limited lifetime. If foam stability in presence of oil has been studied extensively in bulk this is not the case for foam in porous media. When considering gas bubbles separated by thin liquid films, called lamellae, the stability of foam in presence of oil can be described considering the different interfacial tension of the fluids. It appears that foam is destabilized when oil penetrates the liquid films and eventually breaks it.

Improvement of foam stability in presence of oil can be considered in different ways. One possibility is to mix nanoparticles with the surfactant in the foaming solution in order to put the solid particles at the gas/water interface to build a mechanical shield that will prevent oil penetration in the liquid film. The key parameters that have to be considered are the particle size, concentration and composition.
Limited lifetime is mainly due to gas diffusion and gravity drainage in the liquid films. Foam lifetime can be increased using polymer together with surfactant to increase the liquid viscosity and slow down drainage in the lamellae. It has been observed that polymer addition increases lifetime but reduces the foamability, therefore the optimization of this techniques needs to study the possible interaction between surfactant and polymer.

Surfactant adsorption is also a concern as foaming properties can be drastically reduced by a lack of free surfactant in the liquid. This concern implies to choose a surfactant which iconicity will be compatible with the rock type, especially when dealing with carbonates.

All those points will be illustrated and discussed in the Keynote.