Study of foams flows properties in model porous media

A. Mauray[a], M. Chabert[b], H. Bodiguel[a]
[a]*Univ. Grenoble-Alpes, CNRS, Lab. LRP UMR 5520, F-38610 Gières, France*
[b]*Solvay, Novecare, EOR, Singapore 138622*

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1. Introduction

In enhance oil recovery (EOR), to limit viscous fingering, foams are injected by co-injection of a gas and a solution of surfactants in porous media in order to improve oil recovery efficiency. This work focuses on foam transport mechanisms in model porous media using a heterogeneous micromodel made in NOA [1].

2. Results

We studied the transport properties of foam in a model porous medium. Direct measurements show that the pressure drop induces by the flow can be at $Ca=10^{-6}$ as high as 3000 times the pressure corresponding to water injected at the same injection flow rate. This ratio decreases with capillary number like foam flow in rocks [2,3]. An analysis of the preferential paths by direct observations shows that, for low relative gas flow rate, only a few paths are active. However, an increase of the capillary number or the relative gas flow rate leads to a homogenization of the flow in the medium. Thanks to different simple models of straight or wavy channels, we measure that the pressure drop induced by a single bubble follows two regimes.

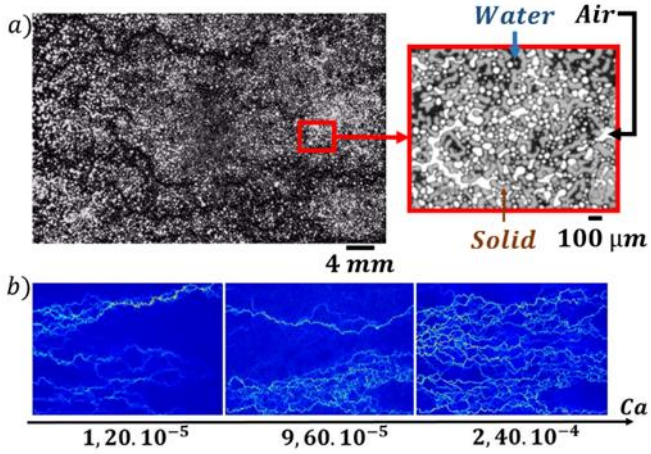

Figure. 1. a) Photo of a foam transport in a porous medium. b) Maps of different preferential paths.

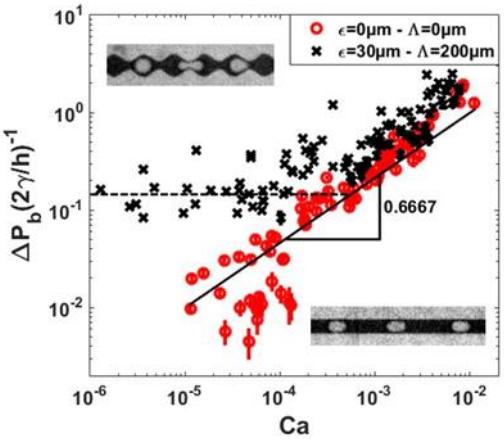

Figure 2. Evolution of the difference of pressure for a single bubble in straight and constricted microfluidic channel.

References

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