RANDOM NETWORK MODEL. OIL RECOVERY CALCULATION

J. MARAÑON DI LEO‡# and J. MARAÑON†*

‡Laboratorio de Capa Límite y Fluidodinámica Ambiental, Dto. Aeronáutica, Facultad de Ingeniería, U.N.L.P.
†Profimo, Dpto. Física, Universidad Nacional de La Plata, C.C. 67, (1900) La Plata, Argentina.
maranon@ayelen.fisica.unlp.edu.ar

Abstract **– Using the porous samples model for miscible fluids developped by Baigorria et al. (1992), some requirements for the improvement of the perfomance of the models are introduced and oil recovery of the fluids matrix when pushing the fluids with miscible fluids is studied. A 50x50 diamond-shaped, random, two-dimensional network of interconnected capillary tubes was used to simulate miscible flow in a porous medium. It can be concluded that this model for porous samples constitutes an important petrophysical laboratory auxiliary for assisted oil recovery calculation.**

Keywords **– Porous media, Miscible displacement, Random network, Oil recovery.**

I. INTRODUCTION

The description of the dynamics of multiphasic fluids in porous media is extremely constrained by the difficulty in connecting microscopic physics with the observed macroscopic phenomena. Whereas on a microscopic scale fluid displacement is approximately described by the microgeometry of the pores and the physical nature of the fluid, an equivalent macroscopic description is achieved through the well-known Darcy's law.

At present, the difficulties for building up a suitable model for a reservoir have their origin in poor background information, which is not odd if we consider that only very few sampling points (usually only the oil-wells) are available to obtain information about a whole reservoir. The development of suitable models depends, among other things, on a satisfactory description of pore structure microgeometry. Any progress towards a coherent theory of microscale features in oil recovery does not only require a reasonable conceptual development, but also an appropriate qualitative analysis of the complex pore structure of the reservoir rock.

A diamond-shaped, random, two-dimensional network of interconnected capillary tubes was constructed to simulate miscible displacement in porous media numerically. An experimental technique was specially devised to measure the ratio between pore volume of displacing fluid injected up to the time of breakthrough, and the total pore volume of the sample, PVI_b / TPV (the subscript b stands for breakthrough). For low heterogeneity media, a unimodal, asymmetric, Gaussian-like tube-radius distribution was used to construct several networks from which a set of values of PVI_b / TPV were calculated and matched against those determined experimentally. For high heterogeneity media, however, a kind of an ad hoc, bimodal, tube-radius distribution had to be constructed to obtain a reasonable match. The experimental and computing difficulties that arise for very highly heterogeneous media are also discussed (Baigorria *et al.*, 1992).

M. Sahimi published an interesting article review about the flow problem in porous rocks (Sahimi, 1993; Sahimi, 1997). He classifed the models for flow, dispersion, and displacement process in reservoir rocks as continnum models and discrete models. Continnum models represent the classical engineering approach to describing

* Author to whom correspondence should be addressed MCIC CONICET
# CIC Comisión de Investigaciones Científicas de la Prov. Buenos Aires.