Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Immiscible fluids in mixed wet porous media: the role of wettability correlations JULIE MURISON, Max Planck Insitute of Dynamics and Self Organisation, BENOIT SEMIN, Laboratorie de Physique Statistique, JEAN-CHRISTOPHE BARET, STEPHAN HERMINGHAUS, MATTHIAS SCHROETER, MARTIN BRINKMANN, Max Planck Insitute of Dynamics and Self Organisation — Various phenomena observed during immiscible displacement in a porous medium can be related to pore wall wettability. Petroleum engineers traditionally quantify the overall wettability of a rock sample in terms of the Ammot-Harvey or USBM index. To establish a link between these gloabl quantities and the pore-scale distribution of surface energies, we developed a series of model porous media. Using a variety of preparation methods, we are able to create dense beds of glass beads with the same average surface energy, differing only in the typical extension of the wetting and non-wetting surface domains. Experimental measurements of capillary pressure saturation curves for repeated imbibition and drainage show that the work dissipated in a complete cycle is monotonically increasing with the correlation length ξ of the surface energies. To test whether capillary hysteresis can be linked to specific features of the front morphology, we visualized the distribution of liquids by means of X-ray microtomography. The Minkowski measures volume, surface area, and Euler number are employed to characterize the interfacial shape. Differences of the front morphology during imbibition and drainage match with trends observed for the hysteresis loop opening.

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Date submitted: 02 Aug 2013 Electronic form version 1.4