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An Experimental Study of Capillary Pressure Hysteresis in Two-Phase Flow in 2D Porous Micromodels RAZIN SAZZAD MOLLA, NISHAGAR RAVENTHIRAN, YAOFA LI, Montana State University, Bozeman — Multiphase flow in porous media occurs naturally in many environmental and industrial systems. A comprehensive understanding of the fundamental flow physics in such systems is essential. For an isothermal two-phase flow in porous media, traditional models often use constitutive relations of capillary pressure as a function of saturation, which exhibit hysteresis. Recently it has been theoretically shown that a unique state equation is possible by adding a few variables in the functional form, which is hysteresis-free and works for both equilibrium and dynamic conditions. However, experiments are needed to validate and further develop the theories. Micromodel is a powerful tool to perform such studies as it offers excellent optical access and control over pore properties. Employing fluorescence microscopy and high-speed imaging, pore flow and its dynamics are captured and investigated. Herein I will be trying to delineate techniques for 2D micromodel fabrication and measurements of capillary pressure, interfacial area, and Euler Characteristic, thus providing a general method for 2D micromodel validation of novel theories regarding hysteresis. The results will provide new insight into the hysteretic behavior of capillary pressure as well as validations of new functional forms.

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