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# FLOW OF YIELD STRESS FLUIDS THROUGH POROUS MEDIA: SIMULATIONS, EXPERIMENTS AND APPLICATIONS

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A Yield Stress fluids injection porosimetry Method (YSM) has recently been developed as a simple potential alternative to the extensively used Mercury Intrusion Porosimetry (MIP). Its main advantage is the use of a nontoxic fluid instead of mercury used in MIP. Using this method, the Pore Size Distribution (PSD) of a porous medium is obtained by measuring the flow rate / pressure gradient relationship obtained by injecting a yield stress fluid in the porous medium. The principle of the method and some experimental results obtained using this technique will be presented and will be compared to those obtained by Mercury Intrusion Porosimetry (MIP).

In the Yield Stress fluid injection porosimetry method, the main assumption is that the porous medium is described as a bundle of straight capillaries of circular cross-section following a given pore size distribution. This simple model is revisited by introducing both non-circular and axially varying cross-sections. Two key points are tackled using numerical simulations: the flow onset at minimal pressure drop and the variation of the flow rate vs the pressure gradient. These results are finally used to show that the flow rate / pressure gradient relationship of a yield stress fluid through a porous medium can be more closely predicted using a bundle of capillaries of irregular cross-sections rather than using the classical bundle of straight circular capillaries.