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Smart microgels for controlling two-phase fluid structure in porous media[1] JING FAN, DAVID WEITZ, Harvard University — Understanding the transport of microgels in porous media directly benefits the conformance improvement technique using preformed gels in the oil industry. We develop a new type of microgels that can swell in response to specific stimuli in an aqueous environment. From a practical point of view, this enables us to deliver the microgels to the deep reservoir formation and control the permeability profile more effectively. With confocal microscopy imaging, we show that we can deliver such smart microgels to the high-permeability region in a stratified porous medium, which subsequently changes the two-phase fluid structure in the medium. From a scientific point of view, this allows for characterizing the permeability change due to homogeneous pore-clogging by soft particles instead of surface clogging; using the typical microgels this can hardly be done because we cannot place gel particles with comparable size to the pore uniformly into a porous medium. This study may shed light on understanding many other processes involving the transport of soft particles in porous structures.

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