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Droplet impact on a porous slice: visualization of simultaneous spreading and imbibition D. JORDAN BOUCHARD, SANJEEV CHANDRA, University of Toronto — Experimentally studying droplet impact and imbibition on porous materials is difficult because most porous materials are opaque, and the time resolution of X-ray imaging techniques is not fast enough to capture the simultaneous spreading and imbibition of a drop. Currently, we must rely on computer simulations to predict how a drop impregnates a porous material during the spreading phase. To gather experimental measurements, we have fabricated thin, optically transparent porous slices using a single layer of glass beads, with average diameters of 500 and 100 microns, sintered between two panes of glass. Using a high-speed camera, we film a 2 mm deionized water drop impacting the porous slices at velocities of 0.06, 0.5, 1.2, and 1.9 m/s, so we can simultaneously capture droplet spread and imbibition into the porous slice. Droplet inertia can drive liquid flow and significantly shorten the penetration time of a drop. If the average pore size is large enough the drop can be entirely driven into the porous medium by the drop's kinetic energy. Smaller pores dissipate the kinetic energy of impact rapidly so that liquid inertia has a negligible contribution to the volume of the drop that penetrates the porous slice. We provide criteria based on our experimental measurements that can be used to predict when inertia driven flow into porous materials will contribute significantly to the total volume of liquid that penetrates the porous material.

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