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**Volumetric microscale particle tracking velocimetry (PTV) in porous media.** TIANQI GUO, SOROUSH ARAMIDEH, AREZOO M. ARDEKANI, PAVLOS P. VLACHOS, Purdue University — The steady-state flow through refractive-index-matched glass bead microchannels is measured using microscopic particle tracking velocimetry ($\mu$PTV). A novel technique is developed to volumetrically reconstruct particles from oversampled two-dimensional microscopic images of fluorescent particles. Fast oversampling of the quasi-steady-state flow field in the lateral direction is realized by a nano-positioning piezo stage synchronized with a fast CMOS camera. Experiments at different Reynolds numbers are carried out for flows through a series of both monodispersed and bidispersed glass bead microchannels with various porosities. The obtained velocity fields at pore-scale (on the order of 10 $\mu$m) are compared with direct numerical simulations (DNS) conducted in the exact same geometries reconstructed from micro-CT scans of the glass bead microchannels. The developed experimental method would serve as a new approach for exploring the flow physics at pore-scale in porous media, and also provide benchmark measurements for validation of numerical simulations.

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