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A Novel Transparent Sediment Simulant for Unveiling the Bed Topography and Interstitial Processes BRANDON HILLIARD, RALPH BUDWIG, DANIELE TONINA, JEFF REEDER, University of Idaho, RICHARD SKIFTON, Idaho National Laboratory — Particle Image Velocimetry (PIV) and Planar Laser-Induced Fluorescence (PLIF) are two commonly used and powerful laboratory experimental methods for whole-field velocity measurements and flow visualization. When they are coupled with refractive index matching (RIM), they can map both velocity fields and porous media architecture. We present a study that utilizes RIM coupled-PIV and RIM coupled-PLIF methods to not only quantify the flow within a packed bed of irregular shaped grains but also to map the internal structure of the porous media. We use a fluoro-carbon polymer with a specific gravity of 1.97 and optical properties similar to that of water as a simulate for sediment grains within a flow cell. These irregular grains, varying in shape and size, provide a structure that may simulate stream bed sediment and other porous media of granular materials. Here, we present the first experiments and discuss the image processing of both PIV and PLIF experiments, the image quality necessary for mapping the grain bed, and its errors and limitations. Our results pave the way for a novel application where both biological (microbial growth) and physical processes can be studied simultaneously.

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