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Nano-PIV for flows near nano-structured surfaces GEA PARIKESIT, RALPH LINDKEN, JERRY WESTERWEEL, Delft University of Technology — Previous studies have shown that nano-structured surfaces can exhibit different wetting characteristics and higher slip-length values compared to smooth (i.e. non-structured) surfaces. In order to quantitatively measure the flows near such nano-structured surfaces, a Nano-PIV method with high spatial and temporal resolution is required. The TIRF-based PIV is a good candidate because it has been successfully applied for 3D nano-velocimetry near smooth surfaces, but it cannot be applied in a simple and direct manner since the nano-structures optically complicates the measurements: (i) they spatially influence and modulate the TIRF illumination, and (ii) they increase the probability of obtaining errors caused by the tracers' own emitted evanescent-waves. For fabricated periodic nano-structures with known dimensions and geometry, however, the spatially modulated TIRF illumination can be very useful for (i) a simple estimation of the illumination depth directly inside the microfluidic channels, and (ii) detection and measurement of the thin layer of air bubbles trapped at the nano-structures in the 'Cassie-Baxter' wetting mode.

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