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Liquid flow over a substrate structured by seeded nanoparticles and slip boundary condition ALEX LUKYANOV, University of Reading — Recent experiments have demonstrated that already sparsely distributed, over a solid substrate, nanoparticles can change substantially the amount of liquid slip at the surface. Inspired by the observations, the flow past small particles seeded on a solid substrate is investigated theoretically on the basis of an interface formation model. It has been demonstrated, for the first time, that even a single seeded particle can create sufficient surface tension gradient, with the characteristic length scale independent of the particle size, to reduce significantly the (measurable) tangential component of hydrodynamic velocity at the substrate and thus to adjust the slip boundary condition. But, it has been established, that the effect from the particle is essential for the actual slippage, while the apparent slip would be only partially disturbed. This outcome of the analysis is crucial for future experiments and can be potentially used to identify exactly the mechanism of slip in particular situations. A comparison with the experiments has shown that the results of the theoretical analysis are quantitatively consistent with the experimental measurements, in particularly the maximal separation distance between the particles to observe the deterioration of slip.

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