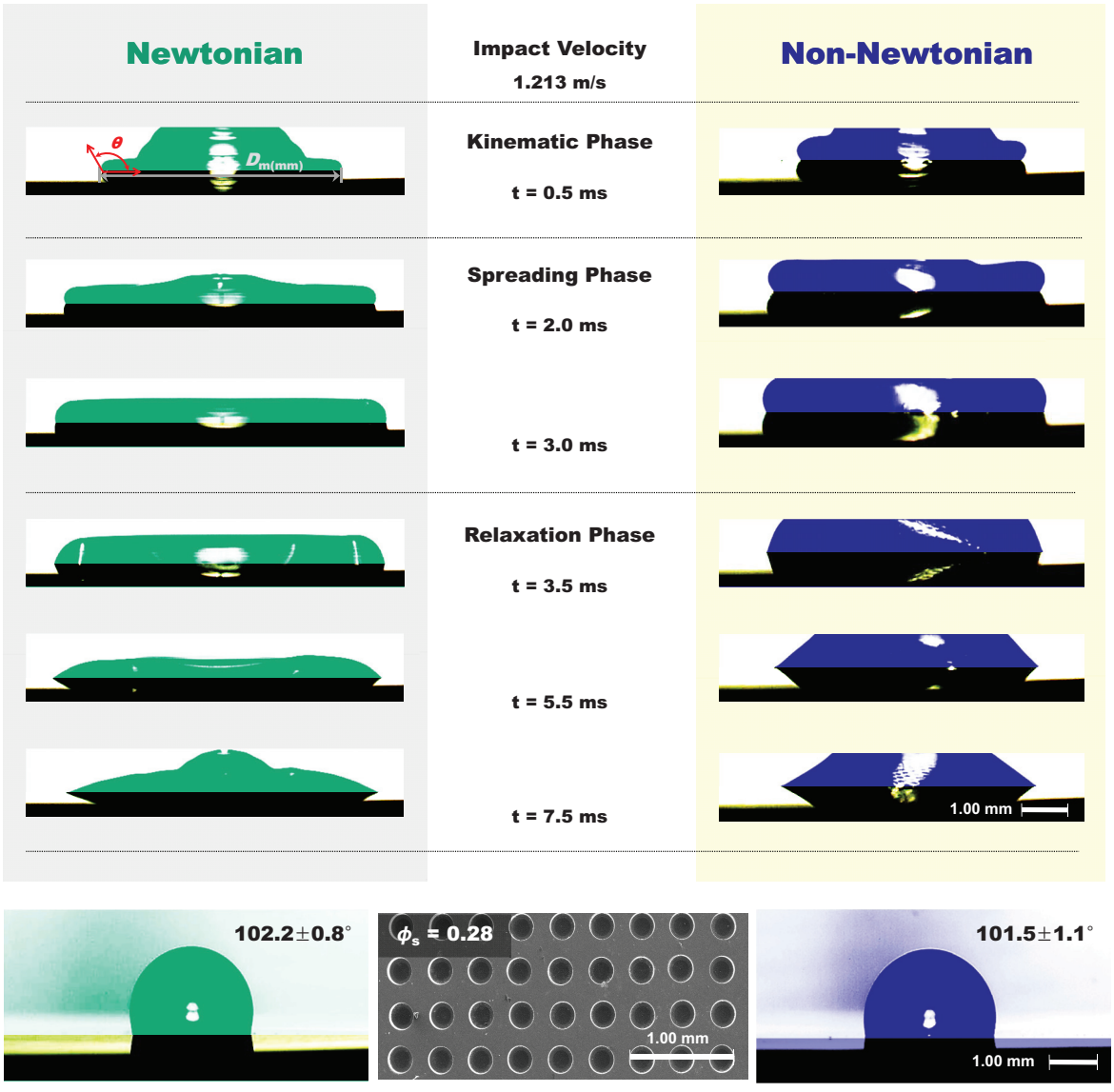

Dynamics of a non-Newtonian Droplet Impact on a Micro-Textured Surface

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This study investigated the impact dynamics of single Newtonian and non-Newtonian droplets impinging on a textured aluminum (Al 6061) surface fabricated by using a μ-computer numerical control (μ-CNC) machine. DI-water was chosen as a Newtonian fluid, while 0.5 wt.% Xanthan Gum (Sigma-Aldrich) solution was selected for a non-Newtonian fluid. The non-Newtonian droplets show a shear-thinning characteristics, higher zero shear viscosity than DI-water. The textured surfaces are composed of micro-holes (diameter: 250 μm, depth: 500 μm) with equivalent pitches, without showing very similar apparent equilibrium contact angles of both Newtonian and non-Newtonian droplets. We measured spreading and receding diameters from images captured by a high-speed camera of 10,000 fps (HG-LE, Redlake). 6.4 μl droplets impinged on the textured surfaces (ϕ_s=0.28) with an impact velocity of 1.213 m/s. The normalized maximum spreading diameter (D^*) of a non-Newtonian impinging droplet is the smaller, and the corresponding lamella thickness is the larger because of the increase in viscosity dissipation. For a non-Newtonian fluid, the receding is also slower than that of Newtonian fluid at the relaxation phase because of the viscosity effect.

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