Abstract Submitted
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Rolling, sliding, and sticking of viscoplastic xanthan gum solution drops on a superhydrophobic surface MINYOUNG KIM, Korea Institute of Science and Technology, EUNGJUN LEE, DO HYUN KIM, Korea Advanced Institute of Science and Technology, RHOKYUN KWAK, Korea Institute of Science and Technology — Dynamics of Newtonian fluid on a non-wettable substrate have been reported, but those of non-Newtonian fluid, especially of viscoplastic fluid showing a yield stress, are not fully characterized yet. Here, we investigate three distinct behaviors of a viscoplastic drop (xanthan gum solution) -rolling, sliding, and sticking- on an inclined superhydrophobic surface with various inclined angles (1-24 degree) and xanthan gum concentrations (0.25-1.5 %). At a low concentration of xanthan gum (low yield stress) and/or a high inclined angle (high gravitational stress), the drop rolls down the surface as the gravitational stress exceeds the yield stress. As the concentration increases, and thus the yield stress exceeds the gravitational stress, the drop stays on the surface like a solid (sticking). However, if we adjust the gravitational stress to induce an adhesive failure between the xanthan gum drop and the surface (but still lower than the yield stress), the drop slides down the surface without rolling. To the best of our knowledge, this is the first direct characterization of the behavior of the viscoplastic drops on an inclined surface considering gravitational stress, yield stress, and adhesive failure.

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