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Abstract

The spreading dynamics of micro-sized droplet impact on solid surface is not only an interesting phenomenon observed in nature, but also plays a crucial role in a variety of engineering applications. Most fluids used in industries always contain various kinds of additives such as surfactants, polymers and particles, therefore the fluids are basically considered to be non-Newtonian. This work presented a numerical investigation on the impingement and spreading of a micro-sized droplet with non-Newtonian rheological properties on a solid surface. The numerical simulations based on finite element scheme with level set method have been carried out to capture detailed impacting and spreading processes. The non-Newtonian fluids was modeled using a Carreau-Yasuda model for the relation between viscosity and shear rate. The results of this study will provide theoretical basis and specific guidance on designing advanced materials, as well as manufacturing micro-devices with high performance, which are based on the deposition of non-Newtonian droplet.

Figures used in the abstract

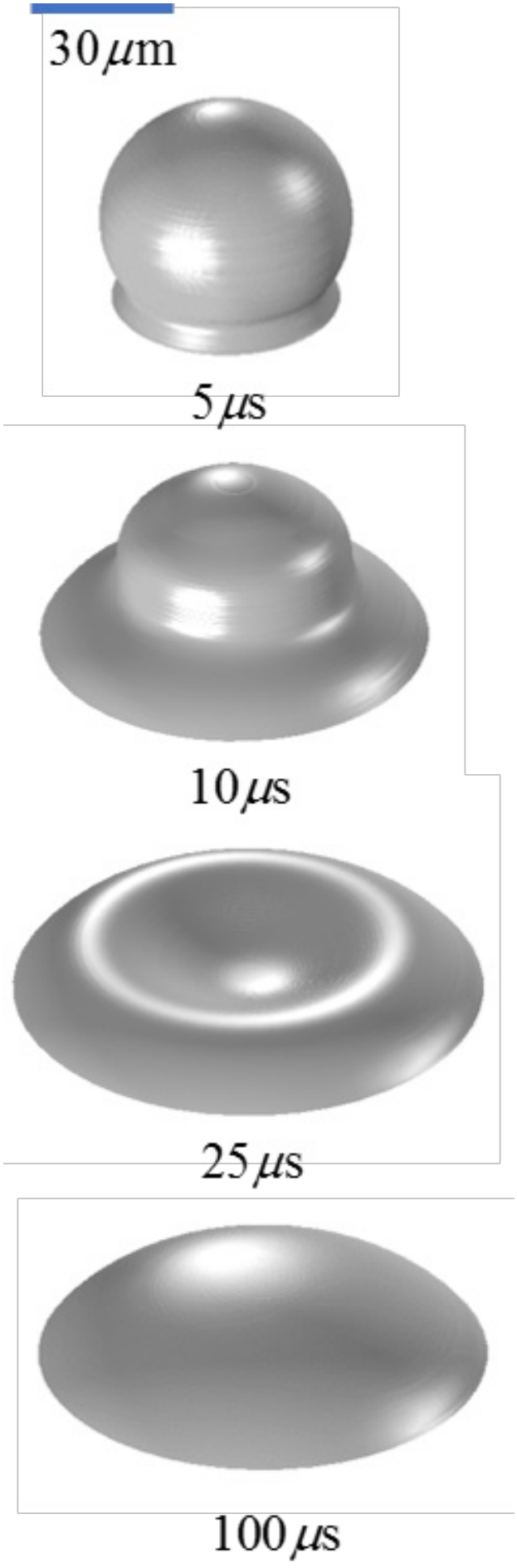

Figure 1: Figure 1 Droplet impinging on a solid surface with static contact angle 50 degrees, droplet initial diameter 55 um， impact velocity 2.45m/s.