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Viscous elastic fluid jets induced by sudden acceleration[1]
YOSHIYUKI TAGAWA, ANDRES FRANCO-GOMEZ, HAJIME ONUKI, YUICHIRO NAGATSU, Tokyo University of Agriculture and Technology — Modern interest for 3D-manufacturing applications requires controlled ejection of liquids with viscous non-Newtonian properties, such as polymer solution and molten resin. In this study, we compare jet evolutions of two viscous polymer solutions with different elasticity but similar shear-thinning properties (i.e. elastic and inelastic). Both jets are ejected by using our novel jet generation system employing an impulsive force (Onuki & Tagawa, Phys. Rev. Applied, 2018). The inelastic solution jets eventually pinch-off into droplets. In contrast, remarkably, jets of the elastic solution completely retract after ejection, even though the initial velocity of the jet is high (>10 m/s). We rationalize these behaviors by considering high elongational rate of liquids, which is beyond an explored range of existing studies. This contribution may open a new door for developing new additive-printing systems.

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Yoshiyuki Tagawa
Tokyo University of Agriculture and Technology

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