Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Impact-induced jets of highly-viscous liquids using a simple structured syringe[1] HAJIME ONUKI, KYOTA KAMAMOTO, YOSHIYUKI TAGAWA, Tokyo University of Agriculture and Technology — In 3D manufacturing, the increment of the ejectable liquid viscosity is crucial. This study introduces a new method for generating a jet of a highly viscous liquid. In our method, a syringe is partially filled with a liquid. The meniscus near the tip of the syringe initially has a concaved shape, which induces the flow-focusing effect during the jet formation. The jet emerges when the short-time impact (e.g., collision with the rigid floor) is applied. Remarkably, the highly viscous liquid up to 1,000 cSt is ejected as a liquid jet. The speed of the jet can be controlled by the liquid height inside the syringe. We discuss the reason why the new method can eject the highly viscous liquid based on our previous theory (Onuki et al., Phys. Rev. Applied 2018). We find that, thanks to the geometrical relation, the gradient of the pressure impulse (time integration of the pressure) inside the tip of the syringe is strongly increased, resulting in increasing the jet speed.

[1]JSPS KAKENHI Grants (No. 17H01246, and 17J06711)

Hajime Onuki
Tokyo University of Agriculture and Technology

Date submitted: 31 Jul 2019 Electronic form version 1.4