Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Gelatin cavity dynamics in the wake of high-speed solid sphere impact[1] AKIHITO KIYAMA, Tokyo University of Agriculture and Technology, MOHAMMAD MANSOOR, NATHAN SPEIRS, Utah State University, YOSHIYUKI TAGAWA, Tokyo University of Agriculture and Technology, TADD TRUSCOTT, Utah State University, TUAT COLLABORATION, USU COLLABORATION — We investigate the impact and penetration of a small solid sphere onto gelatin at speeds greater than 100 m/s. High-speed videography allows us to capture the cavity dynamics in the wake of the sphere. Varying the gelatin concentrations affects the elastic response of the medium. The high-speed videography reveals several unique features of the cavity dynamics in gelatin when compared to water (e.g., the appearance of the texture on the wall of gelatin cavity, the attenuation of the vertical jet upon the pinch-off of gelatin cavity). We present a phase diagram that classifies the cavity pinch-off type using the elastic Froude (inertia vs. elasticity) and the elastic Grashof (gravity vs. elasticity) numbers (Akers & Belmonte, J. Non-Newtonian Fluid Mech., 2006), similar to the Weber and Bond numbers used for water entry (Aristoff & Bush, J. Fluid Mech, 2009). We also discuss the detailed dynamics of each cavity type based on high-speed images.

[1]JSPS KAKENHI Grant number 16J08521 and 17H01246, and support from Tokyo University of Agriculture and Technology

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Date submitted: 01 Aug 2019 Electronic form version 1.4