

Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Spray Formation of Herschel–Bulkley Fluids using Impinging Jets¹ NEIL RODRIGUES², JIAN GAO³, JUN CHEN, PAUL E. SOJKA, M.J. Zucrow Laboratories, Purdue University — The impinging jet spray formation of two non-Newtonian, shear-thinning, Herschel–Bulkley fluids was investigated in this work. The water-based gelled solutions used were 1.0 wt.-% agar and 1.0 wt.-% kappa carrageenan. A rotational rheometer and a capillary viscometer were used to measure the strain-rate dependency of viscosity and the Herschel–Bulkley Extended (HBE) rheological model was used to characterize the shear-thinning behavior. A generalized HBE jet Reynolds number $Re_{j,gen-HBE}$ was used as the primary parameter to characterize the spray formation. A like-on-like impinging jet doublet was used to produce atomization. Shadowgraphs were captured in the plane of the sheet formed by the two jets using a CCD camera with an Nd:YAG laser beam providing the back-illumination. Typical behavior for impinging jet atomization using Newtonian liquids was not generally observed due to the non-Newtonian, viscous properties of the agar and kappa carrageenan gels. Instead various spray patterns were observed depending on $Re_{j,gen-HBE}$. Spray characteristics of maximum instability wavelength and sheet breakup length were extracted from the shadowgraphs.

¹Multi-University Research Initiative Grant Number W911NF-08-1-0171

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Date submitted: 31 Jul 2015

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