Abstract Submitted
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Generation of Soft Shockwaves by High-Speed Non-Rigid Liquid Spray[1] SEONG-KYUN CHEONG, Argonne National Laboratory, KYOUNG-SU IM, CHRISTOPHER POWELL, XIN LIU, JIN WANG, MING-CHIA LAI, Wayne State University, FUEL SPRAY TEAM TEAM — High-pressure, high-speed sprays are an essential technology in many applications, including fuel injection systems, thermal and plasma spray coating, and liquid-jet machining. Those liquid jets, often optically opaque due to the highly dense liquid droplets surrounding the sprays, can travel at supersonic speeds and generate shockwaves. It has been believed that the shock wave can be sustained through only continuous compression with dissipative and irreversible process. However, the characteristic of the shockwaves generated by the liquid jet is different from those generated by supersonic rigid objects. Unlike those created by supersonic rigid object, the soft shock wave reveals the reversible compression process followed by the decompression process behind of the shock wave front. We employed the time-resolved x-radiograph using synchrotron source to uncover "soft" nature of the shockwaves quantitatively, which is in good agreement with independent theoretical analysis using the computational simulation of fluid dynamics.

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