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Dynamics of the Shock Waves Generated by High-Speed Liquid Jets KYOUNG-SU IM, SEONG-KYUN CHEONG, JIN WANG, aps/anl, MING-CHIA LAI, Wayne State University, TRR TEAM, WAYNE STATE UNIVERSITY COLLABORATION — Ultra fast x-radiography and a multiphase numerical simulation were used to reveal complete dynamical characteristics of the shock waves generated by supersonic liquid jets. Unlike the conventional shock waves by a rigid body compression, this shock waves generated by highly transient liquid jets are characterized by an immediately expansion after short compression caused by the liquid deformation due to aerodynamic drag on the jet front. A transition mechanism from the transonic to the supersonic has been clearly analyzed. With the quantitative analysis and the numerical simulation, the dynamic behavior induced by the compression and decompression in ambient gas in the vicinity of the shock front has been examined, and also we demonstrated the dependence of the shock characteristics on spray angles. Under specific injection condition, we provided the detailed internal structures and interacting mechanisms between the ambient gas and liquid spray jet by simultaneously simulating the fluid parameters such as gas velocities, density contours, and liquid sprays.

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