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A Mixing Length Scale of Unlike Impinging Jets CHIHIRO INOUE, The University of Tokyo, GO FUJII, YU DAIMON, JAXA — Bi-propellant thrusters in space propulsion systems often utilize unlike-doublet or triplet injectors. The impingement of hypergolic liquid jet streams of fuel and oxidizer involves the expanding sheet, droplet fragmentation, mixing, evaporation, and chemical reactions in liquid and gas phases, in which the rate controlling phenomenon is the mixing step. In this study, a defined length scale demonstrates the distribution of fuel and oxidizer, and therefore, represents their mixing states, allowing for providing a physical meaning of widely accepted practical indicator, so called Rupe factor, over half a century of injector design history. We concisely formulate the characteristic velocity in a consistent manner for doublet and triplet injectors as a function of propellant injection conditions. The validity of the present formulation is convinced by comparing with hot firing tests.

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