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Atomization of Non-Newtonian Liquids by a High Momentum Coaxial Gas Jet. Stability Analysis, Modelling and Experimental Validation ALBERTO ALISEDA, University of Washington, EMIL HOPFINGER, LEGI-INPG Grenoble, France, DOUGLAS M. KREMER, ALFRED BERCHIELLI, EMILIA K. CONNOLLY, Oral Products Center of Excellence. Pfizer, Inc, JUAN C. LASHERAS, UCSD — The atomization of a liquid jet by a co-flowing, high-speed gas has been studied for non-Newtonian polymer solutions. In this study, the R-T model originally developed by Varga et al. (2003) is extended to viscous and non-Newtonian fluids by applying the general dispersion relation developed by Joseph et al. (2002). When viscous effects are negligible the maximum amplification wavenumber is $k_\sigma = \sqrt{a\rho_l/(3\sigma)}$. On the contrary, when viscous effects are dominant, the wavenumber for maximum amplification can be approximated by $k_\alpha = \sqrt[3]{a\rho_l^2/\alpha_l^2}$. If the effects of surface tension and viscosity are assumed to be additive, the resulting R-T instability wavelength can be estimated as $\lambda_{RT} = 2\pi(\sqrt{3\sigma/(a\rho_l)} + C_2\sqrt[3]{\alpha_l^2/(a\rho_l^2)})$. The model obtained from the theoretical analysis has been validated from droplet diameter measurements of the atomization of six different liquids under a wide range of experimental conditions. The diameter and axial velocity of the liquid droplets was measured by Phase Doppler Particle Analyzer.

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