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Internal Flows in Impacting and Coalescing Droplets of Different Surface Tension[1] THOMAS C. SYKES, University of Leeds, ALFONSO A. CASTREJON-PITA, University of Oxford, J. RAFAEL CASTREJON-PITA, Queen Mary University of London, MARK C. T. WILSON, DAVID HARBOTTLE, ZINEDINE KHATIR, HARVEY M. THOMPSON, University of Leeds — Internal flows determine the extent of advective mixing within coalescing droplets, which can be enhanced by complex flow structures such as internal jets. Good mixing is needed in applications ranging from reactive inkjet printing to open-surface microfluidics, where coalescing droplets often consist of different fluids with distinct properties. The mixing of impacting and coalescing mm-sized droplets, with different properties, in contact with a substrate is studied using two colour high-speed cameras (side and bottom views). This arrangement allows internal and surface phenomena to be distinguished, and hence the true extent and mechanism of mixing to be determined. Given enough lateral droplet separation, the impacting droplet inertia generates a surface jet atop the originally sessile droplet, which can be enhanced or suppressed through Marangoni flow by modifying the surface tension difference between the droplets. Conditions promoting good mixing are established, with practical implications for lateral separation and deposition order.

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