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Deformation and breakup of droplets in an oblique continuous air stream SURENDRA KUMAR SONI, PAVAN KUMAR KIRAR, PANKAJ KOLHE, KIRTI SAHU, Indian Institute of Technology Hyderabad, india — We experimentally investigate the deformation and breakup of droplets interacting with an oblique continuous air stream. A high-speed imaging system is employed to record the trajectories and topological changes of the droplets of different liquids. The droplet size, the orientation of the air nozzle to the horizontal and fluid properties are varied to study different breakup modes. We found that droplet possessing initial momentum prior to entering the continuous air stream exhibits a variation in the required Weber number for the vibrational to the bag breakup transition with a change in the angle of the air stream. The critical Weber numbers for the bag-type breakup are obtained as a function of the Eotvos number, angle of inclination of the air stream and the Ohnesorge number. It is found that although the droplet follows a rectilinear motion initially that transforms to a curvilinear motion at later times when the droplet undergoes topological changes. The apparent acceleration of the droplet and its size influence the critical Weber number for the bag breakup mode. The departure from the cross- flow arrangement shows a sharp decrease in the critical Weber number for the bag breakup which asymptotically reaches to a value associated with the in-line flow configuration.

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