Droplet Breakup Mechanisms in Air-blast Atomization

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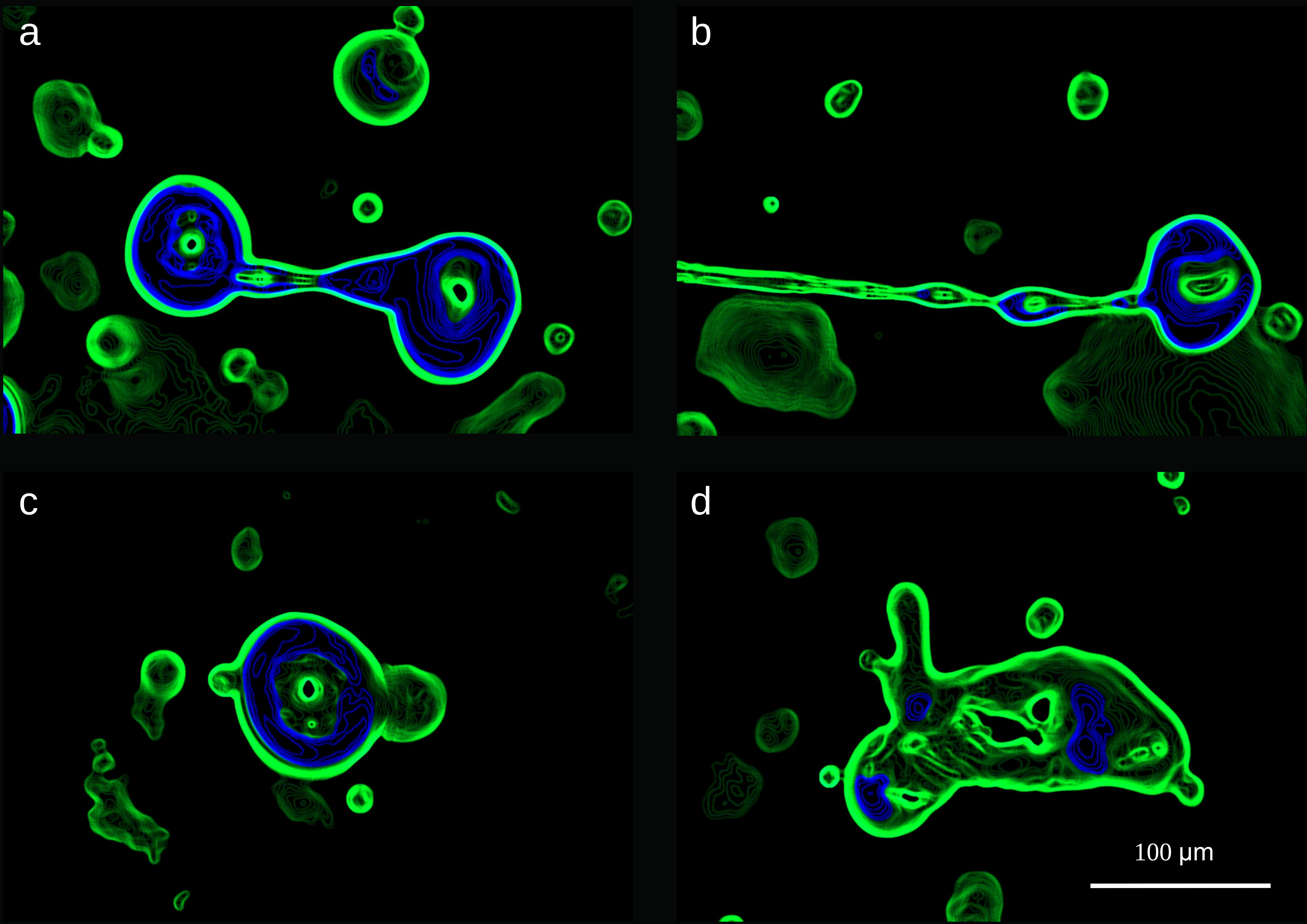
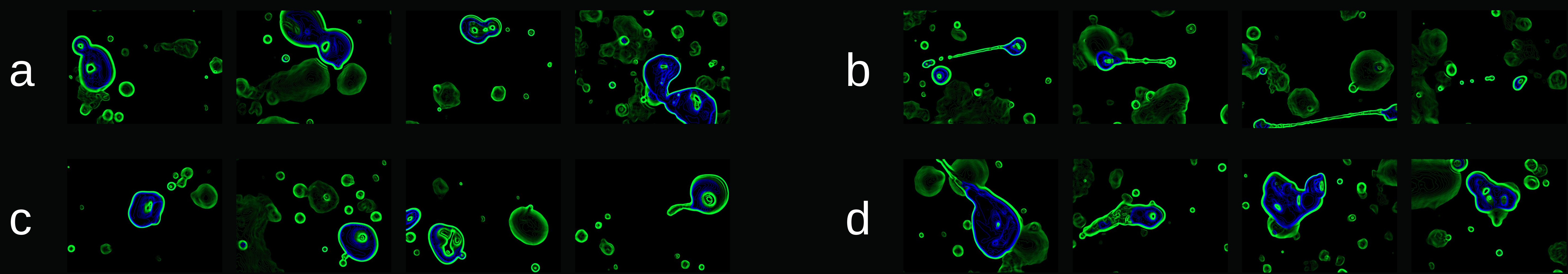
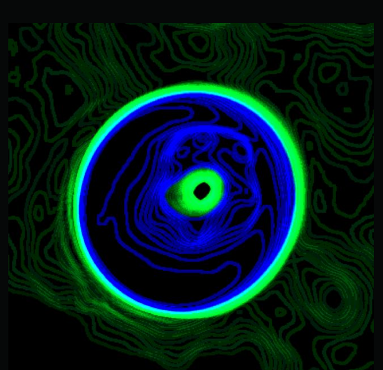


Water droplet breakup observed by high magnification LASER imaging:
(a) Dumbbell, (b) Filament, (c) Stripping and (d) Catastrophe breakup





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Atomization processes are encountered in many natural and man-made phenomena. Examples are pollen released by plants, human cough or spray paint. We have observed breakup processes in an air-blast water atomizer. The droplet breakup mechanisms are detected in four major categories; (a) dumbbell breakup: droplet deforms from the middle and splits into two smaller droplets; (b) filament breakup: the liquid droplet deforms into a long filament that further disintegrates into many finer droplets; (c) stripping breakup: droplet surface is disturbed and small droplets are stripped from it; (d) catastrophe breakup: under highly turbulent conditions, the droplet explodes into many finer droplets. The color contrast in the images quantifies the degree of deformation on the surface of the droplets.