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Analysis of the formation of drops of a Bingham fluid[1] HAIJING GAO, SANTOSH APPATHURAI, PATRICK MCGOUGH, MICHAEL HARRIS, OSMAN BASARAN, Purdue University — Emulsions, dispersions, and foams are both of scientific interest and widely used in technological applications. A way to form such dispersed systems is to flow a liquid or a gas from a tube into a continuous phase of another fluid. In this talk, the dynamics of formation of drops of a Bingham fluid from a tube into a gas are studied computationally. The dynamics are governed by four dimensionless groups: Ohnseorge number, Oh (dimensionless drop viscosity), Weber number, We (square root of dimensionless flow rate), Bond number, G (ratio of gravitational to surface tension force), and yield stress parameter, Y (ratio of yield stress to capillary pressure). Tracking the evolution in time of yielded and unyielded regions in the drop is shown to be crucial for developing a good understanding of the fluid dynamics of the process. The effects of the governing dimensionless groups on the volumes of the primary drops that are formed and whether small satellites as well as large primary drops are produced are investigated. Similarities and differences between the dynamics of formation of drops of Bingham fluids and those of Newtonian fluids are also elucidated.

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