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Emulsification of a very viscous liquid in water J.F. HERNANDEZ-SANCHEZ, R. ZENIT, Inst. Inv. Materiales, Universidad Nacional Autonoma de Mexico, G.M. HOMSY, University of California at Santa Barbara — Although emulsions are used widely, the process of emulsification is still largely based on empiricism. It is our interest to understand the basic mechanism that leads to breakage of a very viscous liquid in water. This particular case is of interest for the petroleum industry, as a means to transport and dispose of oil refining residues. Visualization experiments have been performed to investigate the mechanisms that lead to droplet formation in an ordinary mixing tank configuration. An impeller was immersed in a container with two unmixed immiscible liquids (water/silicon oil) that had a very large viscosity difference (1/30000). The rotational speed of the impeller was gradually increased up to Re $\approx$ 110,000 based on the properties of water, or Re $\approx$ 4, based on those of the oil. The dynamics of the system are, therefore, a combination of turbulent and creeping flows, a regime that has not been widely explored to date. As the rotational speed of the impeller increases the interface between the two liquids develops a curved cup-like shape. When the curved interface reaches the impeller blades, it becomes deformed, disrupted and, if the shear is strong enough, breaks. As a result of the breakage, long viscous filaments form which are stretched and further broken up by a combination of capillary instability and turbulent fluctuations. Visualization images and scaling arguments will be presented. This project is funded by the UC-MEXUS collaboration program.

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