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Coarsening of firefighting foams containing fluorinated hydrocarbon surfactants MATTHEW J. KENNEDY[1], JOHN A. DOUGHERTY[2], NICHOLAS OTTO[3], MICHAEL W. CONROY, BRADLEY A. WILLIAMS, RAMAGOPAL ANANTH, JAMES W. FLEMING, Naval Research Laboratory — Diffusion of gas between bubbles in foam causes growth of large bubbles at the expense of small bubbles and leads to increasing mean bubble size with time thereby affecting drainage. Experimental data shows that the effective diffusivity of nitrogen gas in aqueous film forming foam (AFFF), which is widely used in firefighting against burning liquids, is several times smaller than in 1% sodium dodecyl sulfate (SDS) foam based on time-series photographs of bubble size and weighing scale recordings of liquid drainage. Differences in foam structure arising from foam production might contribute to the apparent difference in the rates of coarsening. AFFF solution produces wetter foam with initially smaller bubbles than SDS solution due in part to the lower gas-liquid surface tension provided by the fluorosurfactants present in AFFF. Present method of foam production generates microbubble foam by high-speed co-injection of surfactant solution and gas into a tube of 3-mm diameter. These results contribute to our growing understanding of the coupling between foam liquid fraction, bubble size, surfactant chemistry, and coarsening.

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