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Early microfluidic dissolution regime of CO_2 bubbles in viscous oils[1] MARTIN SAUZADE, THOMAS CUBAUD, Stony Brook University — We investigate the initial dynamical behavior of dissolving micro-bubbles composed of carbon dioxide gas in highly viscous silicone oils over a range of flow rates and pressure conditions. Microfluidic periodic trains of monodisperse CO_2 bubbles are used to probe the interrelation between bubble dissolution and high-viscosity multiphase flows in microgeometries. The effective mass diffusion flux across the interface is measured by tracking individual bubbles and monitoring their shape as they experience a size reduction. The initial steady mass flux is characterized using a dissolution coefficient that depends on the fluids physicochemical properties. Our findings show the possibility to control and exploit the interplay between capillary and mass transfer phenomena with highly viscous fluids in small-scale systems.

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