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Dynamics of Sub-Micron Bubbles Growing in a Wedge in the Low Capillary Number Regime[1] MICHAEL NORTON, University of Pennsylvania, JEUNG PARK, IBM T. J. Watson Research Center, SUNEEL KODAMBAKA, University of California Los Angeles, FRANCES ROSS, IBM T. J. Watson Research Center, HAIM BAU, University of Pennsylvania — Using a hermetically-sealed liquid cell, we observed the growth and migration of bubbles (tens to hundreds of nanometers in diameter) with a transmission electron microscope. The internal pressure of the liquid caused the thin silicon nitride membranes that comprise the cell's observation windows to bow outward, creating spatial gradients in the liquid cell's height. As a result, growing bubbles migrated in the direction of increasing cell height. To better understand the migration dynamics, we developed a simple, two-dimensional model to predict the translational velocity of a bubble that makes contact with both wedge surfaces as a function of the bubble growth rate and wedge opening angle. The model is valid in the asymptotic limit of zero capillary number and relies on a phenomenological relationship between the contact line velocity and the dynamic contact angle. The theoretical predictions are compared with experimental observations.

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