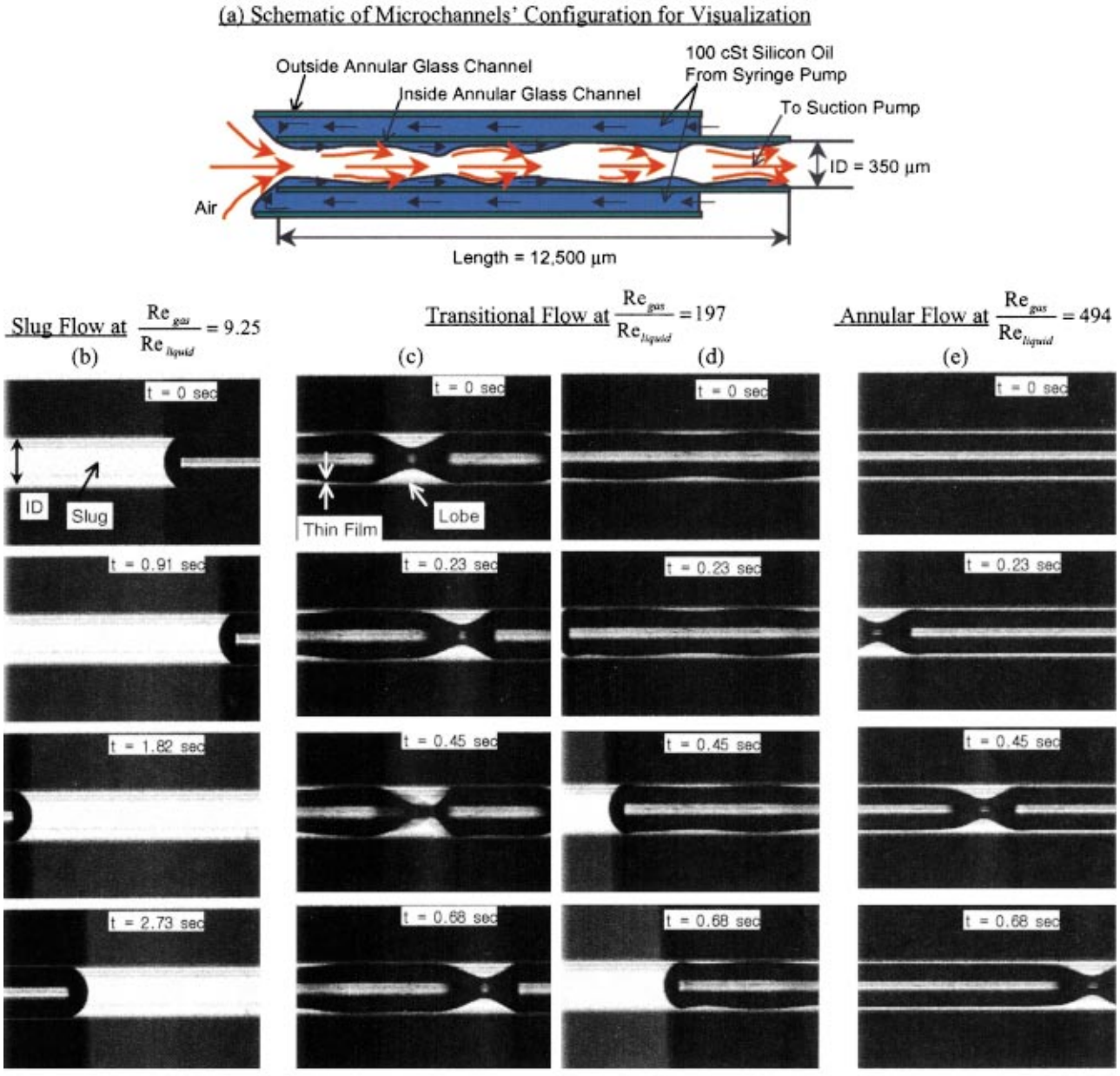

Low Bond Number Two-Phase Flow Regime Transition from Slug to Annular Wavy Flow in a Microchannel

Sang Young Son and Jeffrey S. Allen
National Center for Microgravity Research, Cleveland, OH
Kenneth D. Kihm
Texas A&M University, College Station, TX

The low Bond number flow (Bo = 0.055) regime transition from slug to core-annular flow is visualized. Visualization uses an annular microchannel with a length of 12,500 μm and inside diameter (ID) of 350 μm. An experimental set-up (a) is designed and applied for the visualization. The test configuration minimizes the entrance effect on the flow and maintains a constant mass flow rate of the liquid phase (100 cSt silicon oil). The flow regimes ((b), (c), (d), and (e)) are changing with respect to increasing the ratio of Reynolds numbers (Re_{gas}/Re_{liquid}). (b) is slug flow. (c) and (d) show two transitional modes of regime changing from core-annular to slug flow. In (c), the liquid film wave is amplified until liquid pinch-off occurs. (d) shows that the slug flow, which is generated upstream, penetrates the downstream liquid film wave. The conventional mode of transition such as churn flow or bubbly flow is not observed in this experimental conditions.