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Acoustical and Optical Characterization of Air Entrapment in Piezo-Driven Inkjet Printheads[1] JOS DE JONG, University of Twente, HANS REINTEN, MARC VAN DEN BERG, HERMAN WIJSHOFF, Océ Technologies B.V., MICHEL VERSLUIS, GERRIT DE BRUIN, DETLEF LOHSE, University of Twente — Air entrapment leads to malfunctioning of jet formation in a piezo-driven inkjet printhead. The entrapped air bubbles disturb the acoustics and in many cases cause the droplet formation to stop. Here we will focus on piezo inkjet devices where a voltage pulse applied to a piezo-electric element causes an ink-filled channel to deform, thereby creating a pressure waveform in the ink. The nozzle diameter is typically 30 μm. Droplets are jetted every 50 μs and it is essential that the droplet formation remains stable for an extensive period. Here we detect air entrapment, reveal the air entrapment process, and the time evolution of the entrapped air bubble. The acoustical signal is monitored by using the piezo actuator as a sensor to measure the pressure in the channel after the pulse is applied. This signal is employed to detect air bubbles inside the ink channel and to trigger the optical setup. High speed imaging is employed to perfom optical measurements at microsecond timescales. Once entrapped, the air bubble has an initial radius of 10 μm and oscillates with a frequency near 200 kHz. The radial growth of the bubble is found to be 0.3 μm/ms.

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