Abstract Submitted for the DFD12 Meeting of The American Physical Society

Air Entrapment for Liquid Drops Impacting a Solid Substrate¹ YUAN LIU, PENG TAN, LEI XU, The Chinese University of Hong Kong — Using high-speed photography coupled with optical interference, we experimentally study the air entrapment during a liquid drop impacting a solid substrate. We observe the formation of a compressed air film before the liquid touches the substrate, with internal pressure considerably higher than the atmospheric value. The degree of compression highly depends on the impact velocity, as explained by balancing the liquid deceleration with the large pressure of compressed air. After contact, the air film expands vertically at the edge, reducing its pressure within a few tens of microseconds and producing a thick rim on the perimeter. This thick-rimmed air film subsequently contracts into an air bubble, governed by the complex interaction between surface tension, inertia and viscous drag. Such a process is universally observed for impacts above a few centimeters high.

¹Hong Kong GRF grant CUHK404211 and direct grant 2060418.

Yuan Liu The Chinese University of Hong Kong

Date submitted: 03 Aug 2012

Electronic form version 1.4