



IMPACT AND SOLIDIFICATION OF MOLTEN-METAL DROPLETS ON ELECTRONIC SUBSTRATES

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(a) Rendering of temporal shape variation of a 50 μm solder droplet impacting on a flat Ni/Si substrate. This sequence was obtained using the numerical model of Waldvogel and Poulikakos (1997). The bottom right frame in the sequence defines the shape of the solidified bump. The rings result from the interaction between the droplet oscillation and the upward propagation of the solidification front. Time proceeds from left to right and from top to bottom.

(b) Scanning electron micrograph of a 50 μm solder bump,

as produced by a solder jetting apparatus; see Xiong et al. (1998). Note the remarkable resemblance between the predicted bump shape (final frame in a), and that obtained experimentally (b).

(c) Experimental images obtained via high-speed video when a 1 mm solder droplet impacted on a flat copper substrate. Note the breakup and subsequent reattachment of the secondary droplet during the recoiling after impact. Again, time proceeds from left to right and from top to bottom.