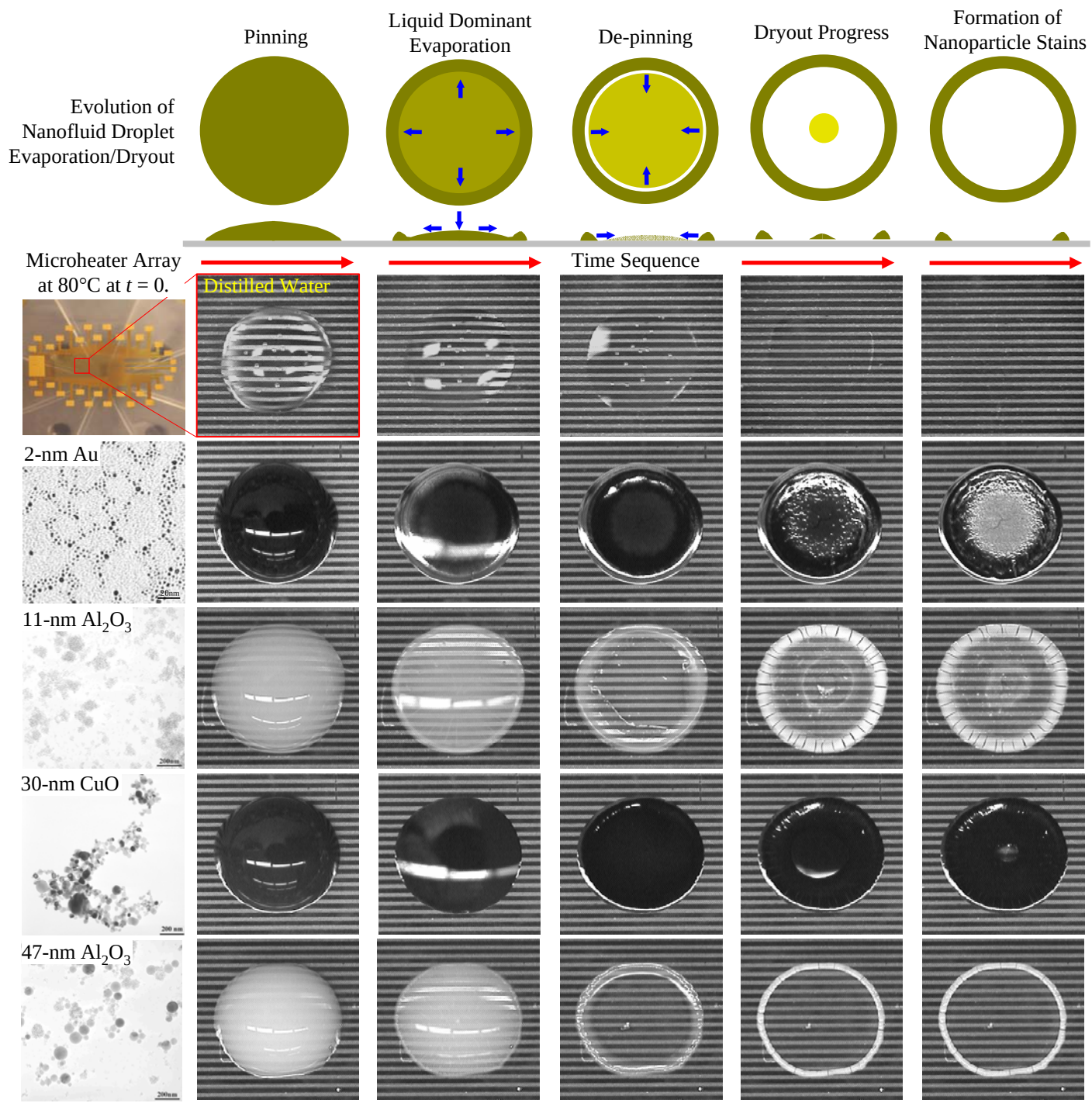

Evaporation and Dryout of Nanofluid Droplets on a Microheater Array

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Nanofluid, a mixture of small concentration of metallic nanoparticles in a base fluid, is known to have substantial enhancement in thermal conductivity compared with that of the base fluid. The evaporation processes of different nanofluid droplets, all for 5-μl, 0.5 vol. % concentration and onto the micro-heater array at 80°C, are visualized to examine the effect of nanoparticle sizes on the dryout characteristics. While the distilled water droplet evaporates evenly in an axi-symmetric way, dryout patterns of the nanofluids containing nanoparticles (2-nm Au, 30-nm CuO, and 11-nm and 47-nm diameter Al_2O_3) are different in leaving concentric rims of dried nanoparticles near the initial wet-surface boundary. The formation of the rim is the most distinctive for the case of nanofluid containing 47-nm Al_2O_3, whereas the rims are less pronounced and more spreading for nanofluids containing smaller nanoparticles. For nanofluid containing 2-nm Au particles, the deposition is thicker and more uniform toward the droplet inner area in comparison with the other nanofluids containing larger nanoparticles. This is believed to be due to its slower flow and higher viscosity as a result of higher particle population, and high specific gravity.