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Condensation Dynamics on Mimicked Metal Matrix Hydrophobic Nanoparticle-Composites[1] VIRAJ DAMLE, XIAODA SUN, KONRAD RYKACZEWSKI, Arizona State University — Use of hydrophobic surfaces promotes condensation in the dropwise mode, which is significantly more efficient than the common filmwise mode. However, limited longevity of hydrophobic surface modifiers has prevented their wide spread use in industry. Recently, metal matrix composites (MMCs) having microscale hydrophobic heterogeneities dispersed in hydrophilic metal matrix have been proposed as durable and self-healing alternative to hydrophobic surface coatings interacting with deposited water droplets [1]. While dispersion of hydrophobic microparticles in MMC is likely to lead to surface flooding during condensation, the effect of dispersion of hydrophobic nanoparticles (HNPs) with size comparable to water nuclei critical radii and spacing is not obvious. To this end, we fabricated highly ordered arrays of Teflon nanospheres on silicon substrates that mimic the top surface of the MMCs with dispersed HNPs. We used light and electron microscopy to observe breath figures resulting from condensation on these surfaces at varied degrees of subcooling. Here, we discuss the relation between the droplet size distribution, Teflon nanosphere diameter and spacing, and condensation mode.

[1] Nosonovsky, M. et al. Langmuir 27 (2011).

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