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Drop Impingement on Highly Wetting Micro/Nano Porous Surfaces CULLEN BUIE, YOUNGSOO JOUNG, Massachusetts Institute of Technology — Recently, we developed a novel fabrication method using a combination of electrophoretic deposition (EPD) and break down anodization (BDA) to achieve highly wetting nanoporous surfaces with microscale features. In this study we investigate droplet impingement behavior on these surfaces as a function of impact velocity, droplet size, and liquid properties. We observe impingement modes we denote as "necking" (droplet breaks before full penetration in the porous surface), "spreading" (continuous wicking into the porous surface), and "jetting" (jets of liquid emanate from the edges of the wicking liquid). To predict the droplet impingement modes, we've developed a non-dimensional parameter that is a function of droplet velocity, dynamic viscosity, effective pore radius and contact angle. The novel dimensionless parameter successfully predicts drop impingement modes across multiple fluids. Results of this study will inform the design of spray impingement cooling systems for electronics applications where the "spreading" mode is preferred.

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