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**Optimal Design of Slippery Liquid-Infused Porous Surfaces for Enhanced Condensation of Low Surface Tension Fluids** DANIEL J PRESTON, ZHENGMAO LU, YAJING ZHAO, DION ANTAO, KYLE WILKE, EVELYN N WANG, Massachusetts Institute of Technology — Vapor condensation is routinely used as an effective means of transferring heat or separating fluids. Dropwise condensation, where discrete droplets form on the condenser surface, exhibits 5 – 7x higher heat transfer performance than filmwise condensation, where the condensate spreads over the surface. However, promoting dropwise condensation of low surface tension fluids is particularly challenging since the typical hydrophobic condenser coatings used to promote dropwise condensation of water (surface tension 73 mN/m) often do not repel fluids with low surface tensions (<30 mN/m). Recent work has indicated that slippery liquid-infused porous surfaces (SLIPS) can promote dropwise condensation of low surface tension fluids by introducing a lubricant immiscible with the condensate into a rough structure on the condenser surface. We developed a detailed model of condensation on SLIPS using the van Oss-Chaudhury-Good theory as a framework to determine the feasibility of any arbitrary solid-lubricant-condensate system, and we validated our model with experimental results. This work enables optimal design of SLIPS for enhanced condensation of low surface tension fluids which promises significant energy savings in applications such as thermal management and power generation.

Daniel Preston
Massachusetts Inst of Tech-MIT

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