Enhanced condensation heat transfer with wettability pattern- ing PALLAB SINHA MAHAPATRA, ARITRA GHOSH, University of Illinois at Chicago, RANJAN GANGULY, Jadavpur University, CONSTANTINE MEGARIDIS, University of Illinois at Chicago — Condensation of water vapor on metal surfaces is useful for many engineering applications. A facile and scalable method is proposed for removing condensate from a vertical plate during drop-wise condensation (DWC) in the presence of non-condensable gases (NCG). We use wettability-patterned superhydrophilic tracks (filmwise condensing domains) on a mirror-finish (hydrophilic) aluminum surface that promotes DWC. Tapered, hori- zontal “collection” tracks are laid to create a Laplace pressure driven flow, which collects condensate from the mirror-finish domains and sends it to vertical “drainage tracks” for gravity-induced shedding. An optimal design is achieved by changing the fractional area of superhydrophilic tracks with respect to the overall plate surface, and augmenting capillary-driven condensate-drainage by adjusting the track spatial layout. The design facilitates pump-less condensate drainage and enhances DWC heat transfer on the mirror-finish regions. The study highlights the relative influ- ences of the promoting and retarding effects of dropwise and filmwise condensation zones on the overall heat transfer improvement on the substrate. The study demon- strated $\sim 34\%$ heat transfer improvement on Aluminum surface for the optimized design.