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Boiling Rayleigh-Benard flow[1] DANIELA NAREZO GUZMAN, UCSB / University of Twente, YANBO XIE, SONGYUE CHEN, University of Twente, GUENTER AHLERS, UCSB, CHAO SUN, DETLEF LOHSE, University of Twente
— We report on heat transport due to boiling of Novec7000 (1-methoxyheptafluoropropane) at the bottom plate of a turbulent Rayleigh-Bénard sample filled with liquid (except for small vapor bubbles when boiling took place). The top surfaces of the bottom plates were silicon wafers etched with a triangular lattice of 30 μm diameter and 100 μm deep cavities. The lattice spacing was different for each wafer (100 μm and 1 mm). The plate diameter and sample height both were 10 cm. Only a central bottom-plate area of 2.5 cm diameter was heated. When the cavities were activated (deactivated) by assuring that they were filled by vapor (liquid), then they nucleated (did not nucleate) bubble formation for bottom-plate temperatures T_b larger than the boiling point. Results of the heat transport as a function of T_b with a fixed applied temperature difference $\Delta T = T_b - T_t = 20$K and $\Delta T = 15$K (T_t is the top plate temperature) will be reported. The effective conductivity of the 2-phase flow was enhanced relative to the supersaturated single-phase system by up to 40%. Direct visualization of the boiling surface showed that larger (smaller) spacing lead to weak (strong) interaction between neighboring sites, which was determining for bubble departure size.

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