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Cooling Enhancement by Drop Impact and Pool Boiling on Nano-textured Surfaces Under Normal Gravity Conditions and at Zero and Increased Gravity in Parabolic Flights ALEXANDER YARIN, SUMAN SINHA-RAY, SEONGCHUL JUN, University of Illinois at Chicago — The earth experiments with drop impact onto metal-plated electrospun nanofiber mats encompass a single drop, or drop trains or jets impacts. The results on drop cooling and pool boiling on nano-textured surface were obtained during the parabolic flights supported by NASA and ESA. Pool boiling on nano-textured surfaces was studied for ethanol and water as working fluids. The nano-textured surfaces were copper platelets covered with copper-plated electrospun nanofibers. The results revealed that the heat flux in boiling on the nano-textured surfaces was about 3-8 times higher than that on the bare copper. This stems from the fact that nano-textured surfaces promote bubble growth by increasing the average temperature of fluid surrounding growing bubbles. Nano-textured surfaces facilitated bubble growth rate and increase bubble detachment frequency. On the other hand, the critical heat flux (CHF) on the nano-textured surfaces was found to be very close to its counterpart on the bare copper surfaces. However, the heat flux on the nano-textured surfaces in transition boiling was significantly higher than on the bare copper ones, since the presence of nanofibers prevented bubble merging and delayed formation of vapor film.

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