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Effects of surface nanostructure and wettability on pool boiling: A molecular dynamics study[1] ARMIN SHAHMARDI, OUTI TAMMISOLA, Department of Engineering Mechanics- KTH Royal Institute of Technology, MAURO CHINAPPI, Dipartimento Ingegneria Industriale, Università degli studi di Roma Tor Vergata, LUCA BRANDT, Department of Engineering Mechanics- KTH Royal Institute of Technology — Effects of surface topology, surface chemistry, and wall superheat temperature on the onset of boiling, bubble nucleation and growth, and the possible formation of an insulating vapour film are investigated by means of large-scale MD simulations under controlled pressure. The simulations reveal that the presence of a nanostructure triggers the bubble formation, determines the nucleation site and facilitates the energy transfer from the hot substrate to the water. On the other hand, the surface chemistry governs the shape of the formed bubble. A hydrophilic surface chemistry expedites the bubble nucleation, however, decelerates the bubble expansion, thus postpones the formation of the film of vapour. Therefore, a hydrophilic surface provides better energy transfer from the hot wall to the water. By analysing the system energy, we show that irrespective of wall topology and chemistry, there is a wall temperature for which the amount of transferred energy is maximum.

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