Abstract Submitted
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Stochastic automata to simulate wettability effects in phase change heat transfer[1] DANIEL ATTINGER, Iowa State University, CHRISTIAN MARCEL, CNEA-CONICET and Balseiro Institute, Bariloche, Argentina, ALEJANDRO CLAUSSE, CNEA-CONICET and National University of Central Buenos Aires, Tandil, Argentina, CHRISTOPHE FRANKIEWICZ, Iowa State University, AMY RACHEL BETZ, Kansas State University — Surface wettability is a key physical property in phase change heat transfer that influences heat-removal mechanisms and/or their relative relevance. A stochastic automata model is provided with rules to simulate pool boiling heat transfer considering the influence of the contact angle [1]. Free bubbles are modeled as a population of virtual spheres that change their geometric properties with simple stochastic rules. The model is validated against published experimental pool boiling data, showing excellent agreement with the boiling curve, as well as with the activation of nucleation sites, in a statistical sense. The sensitivity of the model parameters is studied to assess their influence and relevance. The model also provides information about the behavior of other near-wall relevant quantities, such as the interfacial area density and bubble detachment frequency. The computing time is about two orders of magnitude lower than that required by continuum methods to simulate pool boiling. [1] C. Marcel, A. Clausse, C. Frankiewicz, A. Betz, and D. Attinger, "Numerical investigation into the effect of surface wettability in pool boiling heat transfer with a stochastic-automata model," International Journal of Heat and Mass Transfer, vol. 111, pp. 657-665, 2017.

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