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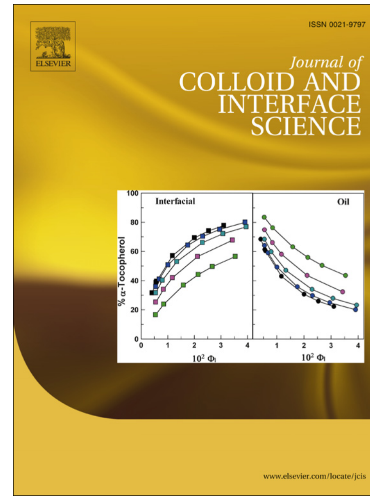

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Drop evaporation on superhydrophobic PTFE surfaces driven by contact line dynamics

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In the present study, we experimentally study the evaporation modes and kinetics of sessile drops of water on highly hydrophobic surfaces (contact angle ~ 160°), heated to temperatures ranging between 40° and 70°C. These surfaces were initially constructed by means of controlled tailoring of polytetrafluoroethylene (PTFE) substrates. The evaporation of droplets was observed to occur in three distinct phases, which were the same for the different substrate temperatures. The drops started to evaporate in the constant contact radius (CCR) mode, then switched to a more complex mode characterized by a set of stick-slip events accompanied by a decrease in contact angle, and finally shifted to a mixed mode in which the contact radius and contact angle decreased simultaneously until the drops had completely evaporated. It is shown that in the case of superhydrophobic surfaces, the energy barriers (per unit length) associated with the stick-slip motion of a drop ranges in the $nJ.m^{-1}$ scale. Furthermore, analysis of the evaporation rates, determined from experimental data show that, even in the CCR mode, a linear relationship between $V^{2/3}$ and the evaporation time is verified. The values of the evaporation rate constants are found to be higher in the pinned contact line regime (the CCR mode) than in the moving contact line regime. This behavior is attributed to the drop's higher surface to volume ratio in the CCR mode.

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