Title:	Effect of Thermal Conductivity on Enhanced Evaporation of Water Droplets from Heated Graphene–PDMS Composite Surfaces
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Abstract:	The dynamics of evaporating water droplets on heated graphene–poly(dimethylsiloxane) (PDMS) composites is investigated experimentally and theoretically. By inserting graphene nucleates in PDMS, we report the effect of change in thermal resistance on the evaporation process of water droplets on the heated graphene–PDMS composite surface. By dispersing graphene within the PDMS matrix, the evaporation of water droplets is enhanced. The graphene nucleate density over the surface was controlled by varying graphene wt % from 0 to 2%, which in turn controls the thermal resistance and hence the evaporation rate. Experimentally, the maximum evaporation rate of 0.0044 μL/s was observed for the sample of 2 wt % graphene–PDMS composite. The evaporation rate on a 2 wt % graphene–PDMS composite surface is about 1.5 times higher compared to that of plain PDMS without graphene. A theoretical model confirms that the initial contact angle and the presence of thermal coupling between liquid droplets and the substrate play an important role in evaporation dynamics. Thermal conductance increases 3 times with the increase in graphene wt % from 0.1 to 2.0 wt % in PDMS. The heat-storing capacity of graphene is responsible for the enhanced evaporation. The experimental findings are in good agreement with theoretical results. These samples were found insensitive to degradation and may find potential applications where high efficiency and high heat flux are needed.
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