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Cold-induced Spreading of Water Drops on Hydrophobic Surfaces

FARYAR TAVAKOLI, PIROUZ KAVEHPOUR, UCLA — Superhydrophobic surfaces received tremendous attention in recent years mainly due to their self–cleaning properties. Wenzel and Cassie–Baxter models for relating stable equilibrium contact angle to physical parameters of liquid and solid ignore tangible factors such as temperature and humidity. Here, we show a peculiar behavior of equilibrium contact angle on cold hydrophobic surfaces. Water drops were cooled by a peltier element to temperatures below the melting point of water and, surprisingly, substantial change in static contact angle and base diameter were observed during the cooling process. Physical variables such as substrate temperature, humidity, drop volume, and even fabrication type of hydrophobic surfaces are found to be detrimental to post–spreading shape.

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