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Rough hydrophobic substrates made from hydrophilic materials?

NEELESH PATANKAR, Northwestern University — Superhydrophobic surfaces have been shown to offer reduced drag. This is useful in microfluidic applications. Surface roughness is one way to make flat hydrophobic surfaces to behave superhydrophobic. This observation is explained by either Wenzel's or Cassie-Baxter's formulas for the apparent contact angle of a drop on rough surfaces. Recent experimental results have shown that rough surfaces made of hydrophilic materials can exhibit hydrophobic behavior. In this work, this problem is considered theoretically. The idea is to make a rough surface with cavities. The rough substrate could show hydrophobic behavior if air remains trapped in the cavities after a liquid drop is deposited on it. The surface geometry should be such that the trapping of air in the cavities is energetically feasible, thus leading to rough hydrophobic surfaces made from hydrophilic materials.

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