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Substrate colonization by an emulsion drop prior to spreading

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Abstract:

In classical wetting, the spreading of an emulsion drop on a surface is preceded by the formation of a bridge connecting the drop and the surface across the sandwiched film of the suspending medium. However, this widely accepted mechanism ignores the finite solubility of the drop phase in the medium. We present experimental evidence of a new wetting mechanism, whereby the drop dissolves in the medium, and nucleates on the surface as islands that grow with time. Island growth is predicated upon a reduction in solubility near the contact line due to attractive interactions between the drop and the surface, overcoming Ostwald ripening. Ultimately, wetting is manifested as a coalescence event between the parent drop and one of the islands, which can result in significantly large critical film heights and short hydrodynamic drainage times prior to wetting. This discovery has broad relevance in areas such as froth flotation, liquid-infused surfaces, multiphase flows and microfluidics.

Bio:
Arun Ramchandran is an Associate Professor in the Department of Chemical Engineering and Applied Chemistry at the University of Toronto. Dr. Ramchandran focuses on generating fundamental understanding in the area of suspensions of rigid and deformable particles through experiment, theory, and computation. He received his BSc in 2001and his PhD from the University of Notre Dame in 2007. He completed his postdoctoral research in the Department of Chemical Engineering at the University of California, Santa Barbara.

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