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Geometrically-controlled drop evaporation: Dynamics and universal scaling law[1] KHELLIL SEFIANE, The University of Edinburgh, PEDRO SAENZ, Massachusetts Institute of Technology, ALEXANDER WRAY, ZHIZHAO CHE, OMAR MATAR, Imperial College London, PRASHANT VALLURI, The University of Edinburgh, JUNGHO KIM, The University of Maryland — The evaporation of a liquid drop on a solid substrate is a remarkably common phenomenon. Yet, the complexity of the underlying mechanisms has constrained previous studies to spherically-symmetric configurations. Here we present an investigation of well-defined, non-spherical evaporating drops of pure liquids and binary mixtures. We deduce a new universal scaling law for the evaporation rate valid for any shape and demonstrate that more curved regions lead to preferential localized depositions in particle-laden drops. Furthermore, geometry induces well-defined flow structures within the drop that change according to the driving mechanism and spatially-dependent thresholds for thermocapillary instabilities. In the case of binary mixtures, geometry dictates the spatial segregation of the more volatile component as it is depleted. In the light of our results, we believe that the drop geometry can be exploited to facilitate precise local control over the particle deposition and evaporative dynamics of pure drops and the mixing characteristics of multicomponent drops.

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