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Sweating Liquid Micro-Marbles: Drop wise condensation on hydrophobic particulate materials MAHESH PANCHAGNULA, Indian Institute of Technology Madras, PRASAD BHOSALE, Department of Chemical Engineering, University of Washington, Seattle — Liquid marbles have been presented as important candidates in such important applications as gas sensing and bulk liquid transport since they were first proposed. In the current study, we present a remarkably simple self-assembly process driven by condensation on a nanoparticulate matrix giving rise to nearly monodisperse liquid marbles whose sizes can be controlled in the range of diameters from 2μm to 1000μm, monodisperse within a few micrometers in distribution width. We show that the primary mechanism causing the formation of liquid marbles is droplet nucleation followed by growth driven by condensation. Drop coalescence in dense droplet ensembles is the secondary mechanism, which attempts to destroy the distribution width controllability. It will also be demonstrated that coalescence dominated growth gives rise to a hitherto unreported growth law owing to the extremely high degree of mobility of embedded liquid marbles. Through a combination of understanding derived from these two physical processes, it will be shown that the proposed process provides control over both the mean marble diameter as well as the marble size distribution.

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