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Coffee-ring effect beyond the dilute limit JIN YOUNG KIM, SEULA RYU, SKKU Advanced Institute of Nanotechnology (SAINT), Sungkyunkwan University, HYUNGDAE KIM, Department of Nuclear Engineering, Kyung Hee University, JOON HEON KIM, JUNG SU PARK, Advanced Photonics Research Institute (APRI), Gwangju Institute of Science and Technology (GIST), YONG SEOK PARK, JEONG SU OH, Department of Genetic Engineering, Sungkyunkwan University, BYUNG MOOK WEON, School of Advanced Materials Science and Engineering, SKKU Advanced Institute of Nanotechnology (SAINT), Sungkyunkwan University — The coffee-ring effect, which is a natural generation of outward capillary flows inside drying coffee drops, is valid at the dilute limit of initial solute concentrations. If the solute is not dilute, the ring deposit is forced to have a nonzero width; higher initial concentration leads to a wider ring. Here we study the coffee-ring effect in the dense limit by demonstrating differences with various initial coffee concentrations from 0.1% to 60%. The coffee drops with high initial concentrations of real coffee particles show interesting evaporation dynamics: dense coffee drops tend to evaporate slowly. This result is different from the classic coffee-ring effect in the dilute limit. We suppose that the slow evaporation of dense coffee drops is associated with the ring growth dynamics. The coffee-ring effect becomes more significant in modern technologies such as self-assembly of nanoparticles, inkjet printing, painting and ceramics. The complexity in evaporation dynamics of colloidal fluids would be able to be understood by expanding the coffee-ring effects in the dilute as well as the dense limits.

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