Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Strength of self-pinning in coffee drops. ANDRZEJ LATKA, KIMBERLY KAWCZINSKI, SIDNEY NAGEL, James Franck Institute, University of Chicago — The equilibrium contact angle θ_e of a liquid drop placed on a solid surface is uniquely determined by a balance of surface tension forces according to Young's Equation, yet is rarely observed in real systems. Due to contact angle hysteresis, liquids can make contact with a surface at any angle between the receding and advancing contact angle: $\theta_R < \theta_e < \theta_A$. A particularly striking example of this phenomenon is the familiar coffee stain. For coffee $\theta_R = 0$, thus as the drop evaporates the contact line remains pinned at its initial location. This results in the majority of the coffee being deposited in a characteristic ring at the drop's original boundary. We investigate how solid particles suspended in a liquid could so strongly influence contact angle hysteresis, by measuring the receding contact angle of a drop at various times during the evaporation process. For low solute concentrations, θ_R slowly decreases as the drop evaporates, but remains positive. Surprisingly, we find that increasing the solute concentration results in $\theta_R = 0$ and a fully pinned contact line almost immediately after the drop is deposited.

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Date submitted: 06 Nov 2015 Electronic form version 1.4