

DY 29: Invited Talk: Karen Daniels (Raleigh)

Time: Tuesday 14:00–14:30

Location: DYc

Invited Talk

DY 29.1 Tue 14:00 DYc

Fingers, fractals, and flow in liquid metals — •KAREN DANIELS
— North Carolina State University, USA

A droplet of pure water placed on a clean glass surface will spread axisymmetrically, and a droplet of mercury will bead up into a spherical droplet. In both cases, the droplet is minimizing its surface energy – creating an object with a minimized surface area – and there is nothing to break the symmetry. Remarkably, droplets of the room-temperature liquid gallium-indium (EGaIn), which like all metals have an enormous

surface tension, can nonetheless undergo fingering instabilities in the presence of an oxidizing voltage. I will describe how this oxide acts like a reversible surfactant, generating fingering instabilities, tip-splitting, and even fractals, through Marangoni instabilities. Remarkably, we find that EGaIn droplets placed in an electrolyte under an applied voltage can achieve near-zero surface tension. This effect can in turn be used to suppress the Rayleigh-Plateau instability in falling streams. Quantitative control of these effects provides a new route for the development of reconfigurable electronic, electromagnetic, and optical devices that take advantage of the metallic properties of liquid metals.