A Novel Technology to Measure Surface Tension of Materials in Microgravity-Application to Additive Manufacturing

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This talk presents a possible technique to measure interfacial tension using electrostatic induced resonance of fluid bilayers. Here, AC electrostatic fields are imposed across a bi-layer of fluids and interfacial patterns are excited as a signal of resonance-induced instability. The idea is to determine the critical voltage and patterns at the resonant state and then correlate this to interfacial tension via theoretical models. The presented work addresses two hypotheses. First, electrostatic forced oscillations of an interface between two fluids result in resonant conditions. Second, a reduced gravity environment reduces the critical voltage allowing for excitation of higher order modes increasing the possibility for self-benchmarking capability and isolating the effects of interfacial tension. Ground and reduced gravity experiments will be shown for a model two-fluid system clearly showing patterns at the onset and the reduced voltage at microgravity. The comparison of ground and flight data will be presented along with key plans for extending to liquid metals.

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