GRADUATE STUDENT RESEARCH SEMINAR SERIES (2018)

SURFACE INSTABILITIES ON SOFT AGAROSE GEL

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Pattern formation on soft solids, as a consequence of surface instabilities interplayed by capillarity elasticity and gravity, is a paradigm for 3-D bioprinting, where bioinks are forced to pinch off into droplets of desired size and dynamic behavior. We analyze two fundamental types of surface instabilities exhibited on soft agarose gels (shear modulus $\mu \leq 260Pa$), depending on the driving force: mechanical vibration and gravity. For the mechanical-excited instabilities, we reveal capillarity affect the dispersion relationship for surface waves on gels with $\mu \leq 85Pa$ and the gravity is pointed out to have a dramatic impact on the dispersion for ultra-soft gels. An theoretical model based on Navier's equation which relating the normal stress on free surface with mean curvature of the surface derived from Young-Laplace in the presence of a gravitational field is developed. The theoretical model agrees favorably with the experimental results. Currently, I am studying the gravity driving instability on soft agarose gels. Non-propagating waves on the free surface of a gel facing downwards are observed which is a consequence of Rayleigh Taylor instability (RTI) on soft solids.

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EIB 132