Visualization of Plastic Crystallization and Foaming Behaviors under Stress (*New - Fall 2018*)

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High-performance composite foams with well-engineered crystal microstructures and foam morphologies (i.e., cell population density, foam density, and porosity) are essential to tune the final material properties, such as the barrier, thermal, acoustic, and mechanical performances, and can have diverse applications in the automotive, aerospace, biomedical, and food and electronics packaging industries. In this context, the objective of this research is to achieve a thorough understanding on cell and crystal nucleation, growth, and deterioration phenomena that determine cell and crystal structures in plastic foaming processes. The core research strategy of this research is to develop and utilize innovative visualization systems to capture and study these phenomena. To be specific, three visualization systems have been developed to investigate foaming under both static and dynamic conditions. The dynamic systems are capable induce controllable extensional and shear strain to study the effects of stresses in plastic foaming to simulate conditions in industrial foaming processes, while the static system is key to establish baseline knowledge and to study critical processing parameters in an isolated manner. The wide range of future studies made possible by the visualization systems will be valuable to the development of innovative foaming technologies and foams.

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