MSE SEMINAR

March 23, 2017
113 McBryde Hall
3:30 – 4:30 PM
Refreshments at 3:00 PM

David Anderegg

Graduate Student
Materials Science and Engineering, Virginia Tech

"Simulations of the Non-Isothermal Crystallization of FFF Printed Materials and its Effect on Part Properties"

ABSTRACT

Fused Filament Fabrication (FFF) has gained great popularity in both the academic and industrial spheres due to the low amount of material wasted during processing and the ability to create complex geometries. Despite its vast potential, applications of FFF have been limited largely due to difficulty with achieving high and consistent mechanical properties. Furthermore, FFF technology is mostly limited to amorphous polymers as crystallization has been shown to cause extensive warping in parts and restrict interlayer bonding, also resulting in poor mechanical performance and dimensional stability. Nevertheless, many engineering thermoplastics are semi-crystalline, so being able to overcome the detrimental effects of crystallization is necessary for implementing a wide variety of high performance materials.

Finite difference simulations were implemented to model the transient thermal history, polymer diffusion, and crystallization throughout a model FFF process as a function of practical machine printing parameters. We are able to determine the optimal printing parameters for interfacial bonding and minimal residual stress within the part. We are currently correlating model results to experimental measurements of FFF printed Polyether ether ketone (PEEK) parts in order to validate the accuracy of the models.

BIOSKETCH

David Anderegg is a Masters student in the Polymer Composite and Materials Laboratory, under the guidance of Prof. Bortner in the Department of Chemical Engineering at Virginia Tech. He graduated from Virginia Tech with a bachelor's of science in Materials Science and Engineering and a Chemistry minor in 2017. David is an active member in the Materials Engineering Professional Society in Virginia Tech's Materials Science and Engineering Department. His research focuses on developing predictive models for extrusion based additive manufacturing through both theoretical predictions and in-situ monitoring of the process.