Outreach Program: Plastics Are All Around Us
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My Polymer Chemistry Experience with Professor Ryu

When I applied for the Polymer Chemistry Research program at RPI I did so with the intention of gaining some insight into chemical engineering, a possible career path for me. This week has been a rewarding educational experience that has encouraged me to take a closer look at the plastics that are part of my everyday world and find innovative ways to apply them to various fields of engineering.

Through lectures and hands on labs we have looked at polymers applications in...

- 3D printing
- FTIR
- DSC
- SEM
As sophisticated as the above machines are, we had fun using a less sophisticated (and less expensive) apparatus- the 3D pen.
ABS Darth Vader

ABS Millennium Falcon
FTIR & DSC

Fourier-transform infrared spectroscopy (FTIR) and differential scanning calorimetry (DSC) can be used to determine the chemical structure as well as the glass transition point and melting point of polymers providing useful data to researchers about the properties of polymers and what the properties allow the polymer to be applied to.
Blue ABS Plastic FTIR Data

ABS does not have C=O. Therefore, ketone FTIR peak should be from the coloring pigment additives to ABS.

Wave number (cm$^{-1}$)
Clear PLA Plastic FTIR Data

PLA = poly(lactic acid)

Wave number (cm$^{-1}$)

- C=O at 1750 cm$^{-1}$
- 3000 cm$^{-1}$
- NO
- C=C-H
- C-C-H

PLA = poly(lactic acid)
DSC Results for PLA

Sample: PLA
Size: 10.85 mg
Method: Heat/Cool/Heat
0 °C to 200 °C

PLA: Tg ~ 54 °C & Tm ~ 150 °C.

(semicoloncrystalline)
DSC Results for ABS

ABS Plastic has a glass transition temperature of 105.62°C and no melting point because it is amorphous.
Summary

My polymer chemistry experience with Professor Ryu has encouraged me to consider how I might consider the application of polymers in a field of study that could benefit the world. Many people are well aware of how plastics have polluted our oceans and overcome our landfills but new innovations such as the use of 3D printers allows engineers to develop new uses of recycled plastics. The applications taught in this course could extend into other fields such as biomedical engineering and aerospace engineering. The program was beneficial in demonstrating what real world applications chemical engineering can be applied to. Thank you, Professor Ryu for a remarkable week.