SAND2013-10613P

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Sandia National Laboratories

Photos placed in horizontal position with even amount of white space between photos and header

SNL Electrospinner Status 12/11/2013

Melt Configuration

U.S. DEPARTMENT OF ENERGY | NNSA

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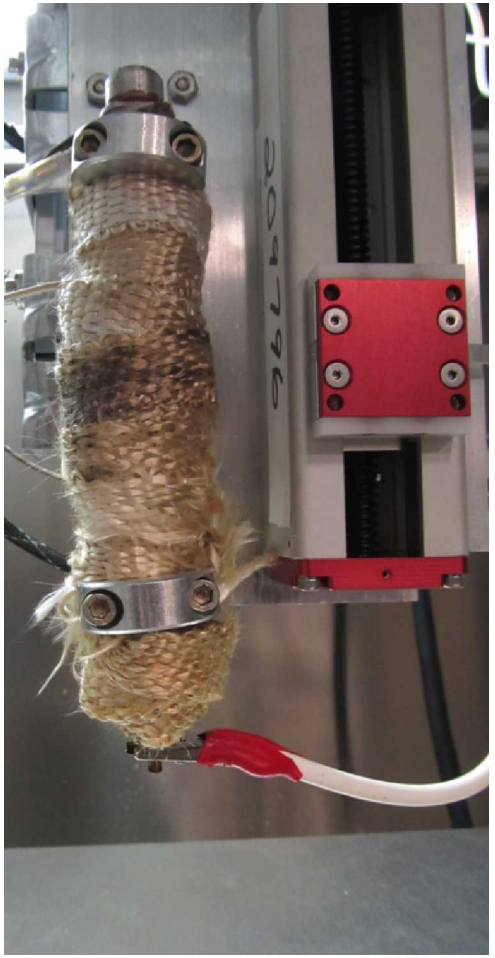
Brief Overview

- Small modification from previous setup (Josh's work)
- Two samples produced using different methods
  - Same machine settings
  - Different CNT concentrations and addition methods
  - Very different observations
- Non-conductive final result
- Next proposed steps

Modification since last spinning

- Heating coil shifted downward

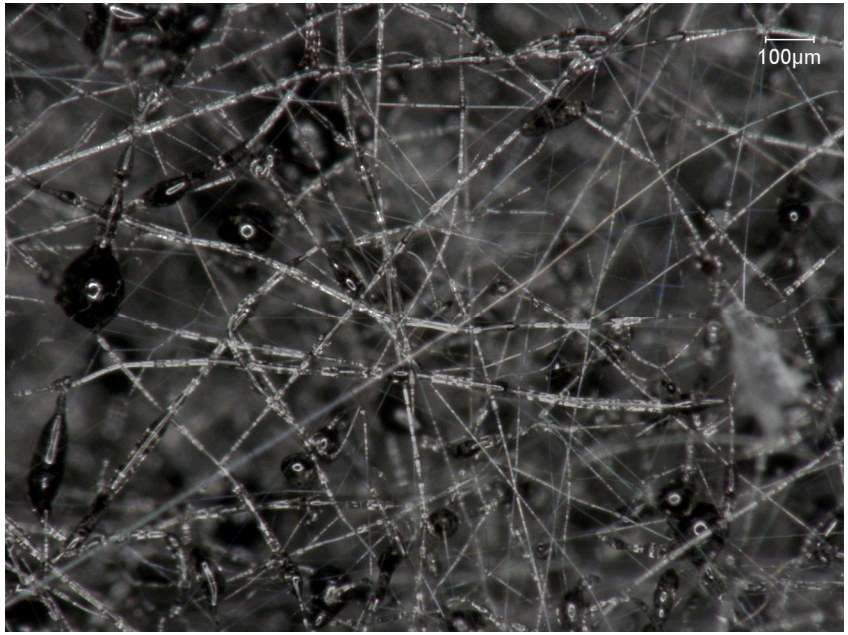


Electrospinner Settings

- Barrel heated to ~ 270°C
- Needle standoff distance: 3 ½ in
- Base plate charge: -30kV
- Needle charge: 0kV
- Uncontrolled flowrate

Sample 1

- 5% wt. CNT
  - Unsure if isotactic 12k Mw or atactic 14k Mw PP
- Adhered to the walls
- Flushed with 12kMw PP
  - Results shown in images
- Non-conductive

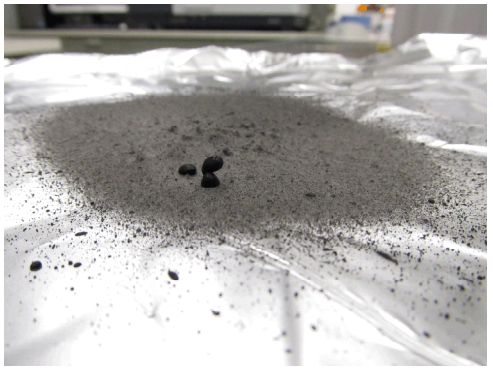


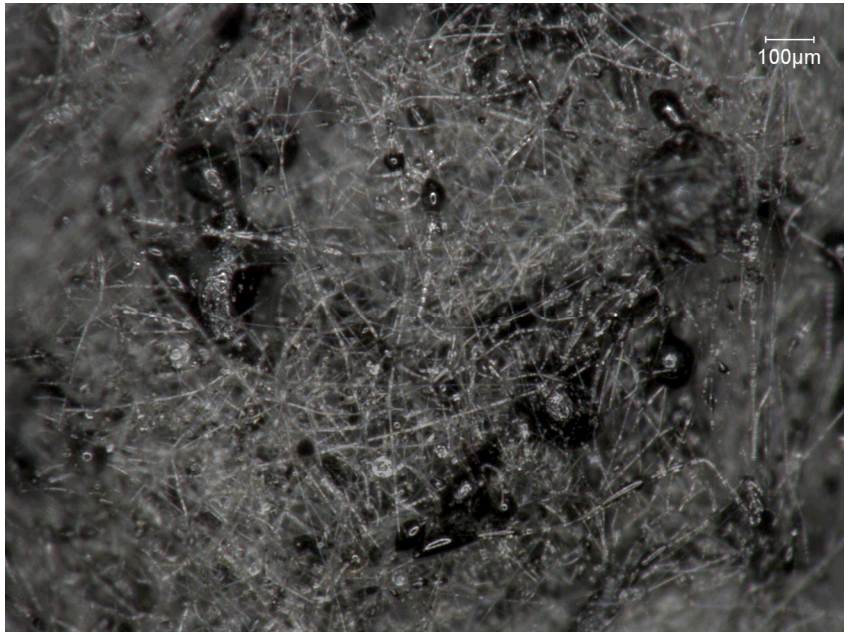
Sample 1 Observations

- Spun similarly to neat 12k Mw Polypropylene
  - No breaks in the thread
- Large agglomerations of 5% wt. CNTs
- High charge needed to pull the solution from the needle and begin Taylor cone formation

Sample 2

- 2% wt. CNT
  - Isotactic 12k Mw PP
- Melted and flowed freely
- Non-conductive





Sample 2 Observations

- Unsteady flow
  - Flow resulted in droplets for the majority of the spinning
- Large agglomerations
  - Needs to be checked to see if they contain CNTs
- High charge needed to pull the solution from the needle and begin Taylor cone formation
- Seems to have partially separated
  - Possibly from unseen residue when cleaned

Next steps…

- SEM imaging to check for CNTs in samples
- Focus on flow control issues utilizing linear stage motors
- Adapt stainless steel syringe instead of current barrel
  - Will need to have the O-rings changed for higher temperatures