# *Efficiently Dispersing Carbon Nanotubes in Polyphenylene Sulfide*

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Thermal plastics are replacing conventional metals in the aerospace, sporting, electronics, and other industries. Thermal plastics are able to withstand relatively high temperatures, have good fatigue properties, and are lighter than metals. Unfortunately, they are not very electrically conductive. However, adding carbon nanotubes to thermal plastics such as polyphenylene sulfide (PPS) can drastically increase the plastic's conductivity at a low weight percent of nanotubes called the percolation threshold. The percolation threshold is the point where adding a little more carbon nanotubes brings together the network of nanotubes and greatly increases the conductivity. We need to learn how to increase the dispersion of nanotubes in PPS to reduce the amount of expensive nanotubes necesarry to reach the percolation threshold. Adding nanotubes to thermal plastics is a difficult procedure. A few different melting and mixing methods have been utilized in previous studies. Initially, we tested how to best disperse the nanotubes using an extruder after physically mixing the two components. We have determined that grinding the PPS pellets to 400 microns and smaller and then coating the PPS powder with the carbon nanotubes in a pulverizer reduces the size and number of carbon nanotube agglomerates in the PPS versus using pellets and mixing by hand. In addition, using moderate screw speeds such as 70 rpm in the extruder helped reduce agglomerates. These results will help us reach the percolation threshold of carbon nanotubes in polyphenylene sulfide while using a smaller amount of the costly nanotubes.