Impact of Recycling on the Mechanical and Thermo-mechanical Properties of Wood Flour/HDPE and PLA Composites

Dilpreet Bajwa (*speaker*)
Associate Professor

Sujal Bhattacharjee
Graduate Research Assistant

North Dakota State University
Fargo, North Dakota

Plastic waste management is a serious environmental concern all over the world. According to US Environmental Protection Agency (EPA), in 2012, almost 31.8 million tons of plastics were generated in U.S. A minimum of 1.14 billion pounds of postconsumer film (which includes plastic bags and packaging) was recovered for recycling in 2013, an increase of 74 percent since 2005. At present, there are three well-known approaches for plastic waste management- (1) disposal in landfills, (2) incineration, and (3) recycling. Disposal in landfills contaminates the soil and the air while incineration makes a total destruction of the material. Recycling is most preferable since it creates no (or little) environmental pollution and reserves the material for further use. The aim of this research was to investigate the influence of recycling on the mechanical and thermo-mechanical properties of wood flour/ HDPE and PLA composites. WPC composite formulations included 30 wt% and 50 wt% oak wood flour filled PE and PLA matrices. The WPCs were recycled up to six times using twin screw extrusion process. Injection molded samples were tested for physico-mechanical properties. Scanning Electron Microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR) techniques were used to investigate the fracture surfaces of tensile samples at different cycles and to monitor the change of molecular structure of the composite matrices respectively. Results show that these composites could be recycled up to six times without substantial degradation in the mechanical properties.