

ECO-FRIENDLY COMPOSITES: MELT FLOW INDEX ANALYSIS OF NANO-SIZE CORN HUSK-FILLED COMPATIBILIZED ETHYLENE HEXENE-1 COPOLYMERMustafayeva F. A.^{1,2}, *Mustafayev E. A.*², Babayeva T. M.²¹Institute of Polymer Materials of Ministry of Science and Education Republic of Azerbaijan, Sumgayit city, Azerbaijan²Sumgait State University, Sumgayit city, Azerbaijan
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In order to increase the qualities of their individual components, two or more materials are combined to create composites. Typically, a polymer resin serves as the matrix in polymer composites, to which one or more fillers are added to meet particular needs or goals. Natural fibers have a promising future as fillers and reinforcements in thermosets, thermoplastics, and elastomers. In recent years, the utilization of agricultural wastes has become a subject of interest in polymer composites, mainly due to the such advantages like very low cost, low densities, high filling levels, recyclability, biodegradability, and renewable nature [1, 2]. In this study, the effect of nano-size corn husk loading on the melt flow index of ethylene hexene-1 copolymer composites has been reported.

The ethylene hexene-1 copolymer (EHC) used as matrix material in this work was a commercial product of KIMIA JAVID SEPAHAN Co. under the trade name Kimcross 1230/1331. The corn husk was washed with distilled water, then dried, ground, and sieved. Particle size analyses of the ground corn husk were performed by a Mastersizer 3000 (Malvern Instruments, UK) particle size analyser, based on laser scattering and the average particle size was measured. When the particle size distribution of corn husk was observed, D (10), D (50), and D (90) values of corn husk were determined to be 0.0240 μm , 0.0855 μm and 0.248 μm , respectively. 1 wt % LIBAID T-2 (Liberty Chemicals) processing aid and 2 wt % Exxelor TM PO 1020 (ExxonMobil Chemical) compatibilizer were used in the preparation of the samples. The nanocomposites were obtained by mixing the components for 10 minutes in hot rollers heated to 150 °C and rotating at a speed of 50 rpm.

Melt flow index (MFI) measurements were conducted to obtain information about the rheological properties of the composites. The MFI was measured using a Instron CEAST MF50 Melt Flow Tester rheology device. The measurements were carried out by applying a load of 5 kg at 190 °C for all the composites used in this work. To establish a correlation between the nano corn husk particles content and the MFI, the melt flow indices of various composites were studied. The MFI of EHC at a load of 5 kg and a temperature of 190 °C is approximately 1.8 g/10 min. Values obtained for composites based on corn husk nanoparticles are somewhat higher. Compared to pure EHC, MFI of the composites increased with the addition of nano-size corn husk powder. The MFI of composites based on nano corn husk powder with a filler content of 1, 3, and 5 wt.% was 1.8, 2, and 2.2 g/10 min, respectively. The obtained result, reflected in the values of the MFI, during industrial implementation allows the use of both injection and extrusion methods for the production of composite materials.

References

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