

EXPERIMENTAL INVESTIGATION OF MECHANICAL AND WEAR BEHAVIOUR OF POLYMER COMPOSITES OF BN & Si₃N₄ NANO FILLERS

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ABSTRACT

This research study investigation of polymer composites' mechanical and tribological properties, including nanofillers of ABS/BN, ABS/Si₃N₄, Nylon/BN, and Nylon/Si₃N₄ compositions. All composites were manufactured with a twin-screw extruder and injection molding. ASTM D 618 standards were utilized to investigate the mechanical behavior, such as tensile strength and hardness. The pin-on-disc equipment used to examine the friction and sliding wear behavior was tested under hard steel under dry sliding conditions. Under dry sliding conditions, the tribological behavior of ABS and Nylon polymer composites with BN and Si₃N₄ nanoparticles as fillers was examined using a pin-on-disc wear arrangement grid size of 400 fixed with a disc surface. The behavior of wear factors such as sliding speed, normal load, percentage of filler, and sliding distance on the wear rate was studied. An experiment based on Taguchi L9 approaches was executed to obtain data control. Utilizing an orthogonal array and analysis of variance (ANOVA), the influence of process parameters on the wear rate of these composites was determined. The results demonstrate that incorporating BN and Si₃N₄ as filler materials in ABS and Nylon composites significantly boost their wear resistance. Utilizing scanning electron micrographs, the fracture morphologies were analyzed. The experimental examination revealed that the addition of BN and Si₃N₄ fillers enhanced the blend's hardness. The addition of nanofillers decreased the blend's wear rate. The composites' wear loss increased as the typical load rose. The polymer composites blended specimens with Nylon/BN nanofillers exhibited the lowest wear rate identified. As the applied force and sliding distance increased, the size and quantity of the platelets or flakes also increased. Scanning electron micrographs have been added to the data to help researchers learn more about how the composites might wear.

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