SIMULATION ON EFFECT OF FLOW INDUCED FIBER ORIENTATION ON THE MECHANICAL PROPERTIES OF FIBER REINFORCED COMPOSITES

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ABSTRACT
Nowadays, fiber reinforced plastic composites are replacing metals which are being used for many years. This is due to the fact that fiber reinforced plastics have high strength to weigh ratio, low cost compared to metals, and high resistance to corrosion. This paper aims to simulate the effect flow induced fibers orientation on the tensile properties of short glass fiber reinforced nylon composites. Dog-bone shaped tensile testing shapes were simulated using commercial software called ANSYS. For the simulation, the concentration of the glass fiber was varied as 10%, %, 20%, and 30% by weight. First, the orientation state of the fibers during molding were determeined experiemnatlly and it was observed that majority of the fibers were aligned to the flow directin near to the top and bottom mold walls whereas they aligned perpendicular to the fow direction in the core region. Structured mesh was constructed with 2623 elements and 2804 nodes. As in input for the simulation, elastic modulus for each composite was obtained by performing tensile test experiment. The simulation results indicated that the yield stress values increased significantly from 13.21 MPa for pure nylon to 56.65 MPa for 30% by weight glass fiber which leads to a conclusion that the higher the percentage of the glass fiber reinforcement, the higher the tensile strength of the composite would be. Moreover, the numerical results showed a decreasment in deflection with the increments of fiber content. Hence, this study could assist in decisions regarding the design of reinforced composite products.

Keywords: Firefly Algorithm • Hybridization • Modification •