Lattice Boltzmann based CFD modelling of Nano-composite melt flow through a manifold

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Abstract

The combination of polymer melts and CNTs results in the production of light and strong Nano-composites. A screw extruder is commonly used in polymer processing. The mixing performance of the extruder considerably influences the quality and morphology of the final product. In this work a novel predictive modeling based on Lattice Boltzmann method for the dynamic simulation of Nano-composite melt flow through a manifold was presented. The manifold was attached to the extruder. The carbon nanotube concentration and mass flow rate were combined with physical properties of the Nano-composite and were default model parameters. By modeling the manifold geometry, the appropriate flow boundaries were determined, and a solution matrix was produced. The velocity of simulated flow through this matrix was computed, and the appropriate conversions made to yield the maximum pressure. Results obtained based on Lattice Boltzmann method is more accurately than the lattice gas method.

Keywords: Lattice Boltzmann, Lattice gas, CFD modeling, extruder, Nano-composite, manifold.

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