



STUDY ON THE RHEOLOGICAL PROPERTIES OF POLYSTYRENE SUBJECTED TO ULTRA HIGH SPEED INJECTION MOLDING

Shia-Chung Chen, Ping-Shun Hsu, Yu-Wan Lin, Sung-Wei Huang

Department of Mechanical Engineering, Chung Yuan Christian University

email : g9602301@cycu.edu.tw

The purpose of this study is to investigate the rheological behavior of PS melt subjected to ultra high speed injection molding. A on-line slit mold suitable for viscosity measurement was built and equipped with proper mold temperature control unit and pressure sensors. At a screw injection speed of 1000mm/s, the corresponding shear rate ranges between 150000~200000(1/s). In addition to the typical correction (Walter Correction) made for viscosity calculation in a slit type rheometer, corrections were also made considering heat dissipation and wall slip effect. Corrections in heat dissipation may vary the viscosity value by about 6~10% whereas wall slip may also cause the variation of viscosity calculation by about 30 ~50%. The measured and corrected viscosity value in consistence with those measured by capillary rheometer quite well in the shear rate range lower than 5000(1/s). Viscosity values show slight difference and distinguished difference in the shear rate range from 5000 to 20000(1/s) and from 20000 to 150000(1/s), correspondingly, as compared to those measured by capillary rheometer. When shear rate reaches 200000(1/s), the viscosity value saturate to a certain level indicating the second Newtonian behavior of the polymer melt.