

Wall Slip and Melt-Fracture of Polystyrene Melts in Capillary Flow

Taniguchi Takashi, Komuro Ryohei, Kobayashi Koji, Sugimoto Masataka, Koyama Kiyohito

We investigated slip and unstable flow phenomena of polystyrene melts in capillaries from the view of the effects of temperature and molecular weight by using three polystyrene samples with different molecular weights ($M_w=192000$, $M_w=258000$, and $M_w=321000$). The slip velocities are estimated by the Mooney method and the modified Mooney method. We found that the slip velocity increases and the critical slip stress $\sigma_c^{(s)}$ above which a slip starts to occur decreases with the temperature. We also observed the melt-fracture at above a critical melt fracture stress $\sigma_c^{(m)}$ higher than $\sigma_c^{(s)}$. We found that the onset of melt fracture is affected by the extensional stress near the entry region to the capillary in the barrel and the melt fracture tends to easily occur with increase of the molecular weight, but is not sensitive to the temperature.