FLOW VISUALIZATION AND EXTRUDATE SWELL OF NATURAL RUBBER IN A CAPILLARY RHEOMETER: EFFECT OF DIE/BARREL SYSTEM

Authors: Narongrit Sombatsompop, Rapeephan Dangtungee
Published: Journal of Applied Polymer Science, Vol. 82, No. 10, 2001, pp. 2525-2533

An investigation was carried out to examine the effect of die/barrel system on the flow patterns and extrudate swell of natural rubber in the barrel of a capillary rheometer, using a colored tracer as the visualization technique. The capillary rheometer used in this work had two dies located along the barrel, which is novel in rheometer design. The flow of the rubber in the upper barrel was dependent on the piston/barrel action and changed with piston displacement, whereas the complexity of the flow in the lower barrel was dependent not only on the piston displacement, but also on the geometry of the upper die design. The flow patterns that developed in the whole barrel were independent of the die located at the bottom of the barrel. In addition, the change in extrudate swell was associated with the flow occurring in the barrel, residence time, elastic characteristic, and the temperature rise during the flow. It was concluded that the general style of the flow patterns of natural rubber was greatly dependent on the die geometry that the material had previously moved past.