

DETERMINATION OF THE PRESSURE DEPENDENCY OF THE VISCOSITY OF TWO LIQUID CRYSTALLINE CELLULOSE DERIVATIVES, USING PVT DATA

M.T. Cidade¹, M. Fernandez², A. Santamaria²

1 - Materials Science Department ad Cenimat/I3N, Faculty of Sciences and Technology, New University of Lisbon, Campus da Caparica, Caparica, Portugal

2 - Department of Polymer Science and Technology and Polymat, Faculty of Chemistry, University of Basque Country, San Sebastian, Spain

mtc@fct.unl.pt

Melt viscosity is a crucial parameter in polymer science and technology, and its dependence with shear rate and temperature has been the subject of several studies in the past. Despite the importance of the dependence of the viscosity with pressure in polymer processing, in particular in injection moulding where the pressures used may be extremely high (of the order of several tens of MPa), this property has not attained the same interest for researchers, maybe due to the fact that a direct method of measuring the viscosity as a function of the pressure, is not available. In this work we present a combined analysis of Pressure–Volume–Temperature (PVT) and oscillatory flow measurements for two liquid crystalline cellulose derivatives, acetoxypylcellulose (APC) and hydroxypropylcellulose (HPC). This combined analysis allowed for the determination of the pressure–viscosity coefficient $b = \partial \ln \eta_0 / \partial P$ by using a modified version of the Miller equation that accounts for pressure and temperature effect on Newtonian viscosity through the activation energy of flow and PVT parameters.

The pressure-viscosity coefficient, b , found for both APC and HPC is two/ three times smaller than the ones reported for several commercial polymers¹ which shows that the viscosity of our liquid crystalline polymers is less dependent on the pressure.

As far as the authors know, this is the first time that the dependence of the viscosity with the pressure is reported for a liquid crystalline polymer.

Reference

[1] Mercedes Fernández, María Eugenia Muñoz, Anton Santamaría, Seppo Syrjälä, Johanna Aho, “Determining the pressure dependency of the viscosity using PVT data: A practical alternative for thermoplastics”, *Polymer Testing*, 28 (2009) 109–113.

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