



Sociedade Portuguesa de Reologia

Quem são e o que fazem os reólogos em Portugal?

**1º Encontro Nacional
da
Sociedade Portuguesa de Reologia**

LIVRO DE RESUMOS

18 de Fevereiro de 1999

Instituto Superior de Agronomia , Lisboa

THE ADVANTAGE OF DOUBLE-GAP CYLINDERS TO MINIMISE THE UNCERTAINTY OF VISCOSITY MEASUREMENTS

F. T. Pinho

CEFT- Centro de Estudos de Fenómenos de Transporte
DEMEGI, Faculdade de Engenharia da Universidade do Porto
Rua dos Bragas, 4099 Porto Codex, Portugal

Abstract

Concentric cylinders are one of the two most common geometries for measuring shear properties in rotational rheometers, especially those of fairly mobile liquids. For a given rotational speed the rheometers are usually equipped with purpose-built hardware and software that measures the torque and converts both those quantities into a shear rate and stress, or shear viscosity. To obtain these latter quantities the software controlling the rheometers implement equations assuming the fluids under scrutiny have a constant viscosity. Unfortunately that is not the case and most of the fluids have a shear-thinning behaviour.

In this paper a procedure is presented for establishing the uncertainty of viscosity measurements in concentric cylinder geometries. The emphasis is put on assessing the error due to the assumption of a constant viscosity fluid and examples are based on measurements of the viscosity of aqueous solutions of 0.4% CMC and 0.25% xanthan gum using the Physica UM/MC 100 rheometer. The low viscosity of the solutions required measurements to be carried out with the more sensitive double-gap geometry and the results of the analysis show this geometry to be doubly beneficial: it provides higher measured stresses than a single concentric cylinder and the assumption of a constant viscosity introduces nearly symmetric errors in each of the gaps, thus minimising the overall uncertainty of the final result.