

*MT 192 VISCOSITY OF LIQUIDS BY ROTATIONAL VISCOMETRY

SCOPE

This method is intended for characterising the flow behaviour of liquid crop protection formulations. The measurement of non-Newtonian liquids is best carried out by rotational viscosimeters.

OUTLINE OF METHOD

A sample is transferred to a standard measuring system. The measurement is carried out under different shear conditions and the apparent viscosities are determined. During the test the temperature of the liquid is kept constant.

APPARATUS

Rotational viscosimeter with standard measuring system according to ISO 3219 (Note 1).

Thermostat attached to the test system

PROCEDURE

(a) *General operation instruction.* Calibrate the viscosimeter and operate it according to the manufacturer's instructions.

(b) *Sampling and pre-conditioning.* Use a representative sample. If necessary degas the sample by slow stirring with a magnetic stirrer under a moderate vacuum. If the flow behaviour of the liquid changes with time, apply an appropriate ~~shear and relaxation~~ pre-conditioning procedure before carrying out the measurement. The shearing of the sample at increasing rates included in (c) *Measurement* is normally sufficient as pre-conditioning. The measurement results are then taken at decreasing shear rates.

(c) *Measurement.* Pour the liquid into/onto the measuring system brought to 20 °C (unless otherwise specified). Then carry out the measurement at at least two different shear rates beginning with the lowest one (Note 2). Determine a number of viscosities covering a range of shear rates, either in steps or continuously in a ramp (Note 3). Once the highest shear rate has been applied repeat the measurements at the lower shear rates in decreasing order (Note 3).

(d) *Reporting of results.* Report the apparent viscosities determined at different shear rates in table or graph form, preferably in the order of decreasing shear

* CIPAC method 2006. Based on OECD Guideline for Testing of Chemical 114.

MISCELLANEOUS TECHNIQUES

rates. Report all measurement conditions such as: temperature, type of instrument and measuring system and pre-conditioning treatment of the sample.

Note 1 These systems (concentric cylinders or cone and plate systems) are capable of releasing a homogeneous shear rate over the total measuring zone. Instruments are available from companies such as Bohlin, Haake, Mettler and others.

Note 2 Unless otherwise specified, shear rates ~~within~~ should be at least cover the range from 20 to 100 s⁻¹ are recommended.

Note 3 Instead of measuring at controlled shear rates some instruments measure at controlled shear stresses. In both cases viscosity results at different shear rates can be obtained.