VAPOR PRESSURE TESTING

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1 Purpose and Scope

A vapor pressure measurement is required for product classification according to transport regulations. This measurement is required only for products with a flashpoint <61°C. Because our products, which show a flashpoint <61°C and >20°C do have a vapor pressure well that is well below 110 kPa, only samples with a flashpoint >20°C are tested. This method applies to liquid samples.

2 Principle

The measuring principle is basically a vapor pressure measurement against vacuum, while the vacuum is generated not through evacuation, but by introduction of the sample into a measuring chamber and subsequent expansion of the volume of the measuring chamber. In the end the principle of volume expansion by moveable piston exactly matches the principle of sample introduction into an evacuated measuring chamber.

3 Terminology, Definitions and Abbreviations

The vapor pressure is the pressure of the gaseous phase of a substance, which is in thermodynamic equilibrium with the liquid phase of this substance. The absolute vapor pressure of a liquid is the difference between the measured total pressure in the measuring cell and the partial pressure of the dissolved gases.
(Pabs = Ptot – Pgas)

4 Precautions

Typical precautions for laboratory work have to be observed.

5 Instruments, Reagents, Standards and auxiliary materials

- Minivap VPXpert: Vapor Pressure Tester (Grabner Instruments)
- For instrument rinsing: Ethanol (96 Vol%)
- About 25 mL of sample are required for testing (incl. rinsings)

6 Procedure, Instrument Parameters

6.1 Sample Preparation

The sample is filled into screw cap bottle (ca. 25 mL sample) and the filling tube is put into the bottle. Cover the bottle with a parafoil. Volatile samples have to be introduced with a syringe.

6.2 Procedure

Turn on the instrument and activate the measuring programme: By pressing the arrow button "⇒" the cursor is placed onto the measuring programme. Then press "Enter".

Measuring method: „ASTM (USA)" -> „ASTM D6378" Enter -> „Substance" Enter -> use the arrow keys to enter the sample number/name and move the cursor to "End" afterwards.

The following parameters have to be defined in the measuring programme: Cycles .1 (2 measurements are performed one after another), T(m)=37.8℃ (measuring temperature is 37.8℃), T(c)=20℃ (filling temperature is 20°C). After pressing "RUN" the measurement is started, which takes about 10 minutes and requires about 15 mL sample. During measurement the measuring cell is rinsed 3 times with 2.5 mL sample per rinsing. After that 1 mL sample is introduced into the measuring cell. The first equilibrium time takes 3 minutes, the others (for gas correction) take 60 seconds. These parameters can be checked, if the ⇓ button und the RUN button are pressed simultaneously (not during measurement). After the measurement the measured pressures are displayed and have to be noted down. Between the measurement of different samples rinse the instrument with Ethanol (96 Vol%). For the rinsing procedure the residual sample in the filling tube is removed by unplugging the filling tube, emptying it and attaching it to the instrument again. Then the tube is immersed in Ethanol and rinsing is started by pressing the buttons: Rinsing ⇒ Enter. Afterwards the Ethanol is emptied and the next sample is tested. Before turning the instrument off, another Ethanol rinsing is performed.

During and after the test the residual sample is pumped into a waste container on the left side of the instrument. The cap of the waste container has to be kept slightly open to allow pressure relief and thus prevent sample spilling.

7 Reporting

After each measurement the displayed pressures are noted (= kPa at 37.8 °C), the absolute pressure p_{abs} is entered into the product data management system PDM and entered into the Chemges programme. The absolute pressure p_{abs} is used for evaluation. The partial pressure of the P_{Gas} shall be below 10 kPa.

For classification according to transport regulations the relevant vapor pressure limits are 110 kPa and 175 kPa at 50°C.

Conversion from kPa to hPa:

1 kPa = 10 hPa

8 Measuring range, Accuracy

Temperature Range:	20-60 ℃
Pressure Range::	2-1000 kPa
Repeatability:	r=0.50 kPa
Reproducibility:	R=1.63 kPa

9 Literature

Vapor Pressure Tester Manual

10 Appendix

Table 1: Reporting Sheet

Date	Number	Product	P ges [kPa]	Pgas [kPa]	**P abs [kPa]**	Tester