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Application Note

Refractive index of hydrocarbon Liquids

Industry	Petroleum
Instrument	Refractometer
Measurement method	Detection of critical angle of optical refraction
Standards	ASTM D1218

1. Scope

The refractive index is important for the quality control of samples. This Application Note introduces an example of measuring the refractive index of hydrocarbons based on ASTM D1218, Procedure B. The measurement is performed using a digital refractometer in accordance with Procedure B. The standard applies to transparent and light-colored liquid hydrocarbons with refractive index in the range of 1.3300 to 1.5000 at temperatures of 20 to 30 °C. In this measurement example, isooctane (2,2,4-trimethylpentane) and toluene were used as samples.

2. Apparatus

Equipment Refractometer

3. Reagents

Cleaning solution 1 n-Pentane
Cleaning solution 2 Toluene

ASTM D1218 prescribes the above solvents as cleaning solutions. Clean the prism with n-pentane and toluene in that order.

4. Procedure

- Calibration -

1) In the dry state of the prism, perform the calibration by air.
2) Introduce pure water into the prism, then perform the calibration with it.
3) Wipe off any moisture with a paper waste cloth and dry the prism.

- Measurement -

1) In the dry state of the prism, drop in enough to cover the prism with the sample.
2) Measure the refractive index.
3) Wipe off the sample with a paper waste cloth, clean the prism with n-pentane and toluene in that order, and wipe off the cleaning solution.
4) Dry the prism, then perform the next measurement.

5. Example

－Parameter－

The measurement parameters are set by the customer. (Refer to the below.)

Set temperature	20, 25, and 30 ℃
Stability sense	0
Wait time	0(s)
Limit time	60(s)

In the case of changing the measurement temperature, calibrate at the set temperature each time the temperature is changed.
(The measurement parameters are examples for using KEM's Refractometer. They may vary depending on the model.)

－Measurement results－

The measurement results for each sample are shown in Tables 1 and 2. At each temperature, each sample was measured five consecutive times.

Table 1 Refractive index of isooctane

n	20℃	25℃	30℃
n1	1.3915	1.3890	1.3866
n2	1.3915	1.3890	1.3866
n3	1.3915	1.3890	1.3866
n4	1.3915	1.3890	1.3866
n5	1.3915	1.3890	1.3866

Table 2 Refractive index of toluene

n	20℃	25℃	30℃
n1	1.4970	1.4941	1.4912
n2	1.4970	1.4941	1.4912
n3	1.4970	1.4941	1.4912
n4	1.4970	1.4941	1.4912
n5	1.4970	1.4941	1.4912

In this measurement, the same results were obtained to the fourth decimal place.
In addition, the standard states that there is a statistical probability of 5 % that the differences in the refractive index between consecutive measurements performed by the same operator using the same instrument and measuring the same sample under constant conditions would exceed 0.0002.

6. References

ASTM D1218　Refractive Index and Refractive Dispersion of Hydrocarbon Liquids