Uncertainty Evaluation of Viscosity Measurement Standards

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An accurate measurement of the viscosity is required in many industrial fields and research areas. The accuracy and uncertainty of the viscosity measurement can be deduced from the traceability to the national standards system. In this study, one set of Cannon capillary-type master viscometers was tested in a precise temperature-controlled bath to set up a national viscosity standard chain, and the uncertainties of the kinematic viscosity measurements were evaluated in the range of 1 ~ 100,000 mm^2/s.

The top of the viscosity standard chain is pure distilled water. The kinematics viscosity value of pure distilled water is declared as 1.0034 mm^2/s at 293.15 K, 101.315 kPa by ISO/TR 3666-1998. The step-up procedure was used to calibrate a series of master viscometers. The basic ideas of ISO Guide 25 were used to set up the uncertainty evaluation procedure of viscosity measurement.

The maximum relative expanded uncertainties U, at the confidence level of 95 %, of viscosity measurements were 0.2 % in the range of 1~ 2,000 mm^2/s and less than 0.3 % in the case of 2,000 ~ 100,000 mm^2/s. The uncertainty evaluation procedure developed in this study will be useful to verify the measurement accuracy of viscosity.