Development of Standard Vortex Shedding Flowmeter

Yoshiya TEARAO
Metrology Institute of Japan
e-mail:
terao.yoshiya@aist.go.jp
AIST Today;
Vol. 1, No. 9 (2001) 18

The design of a vortex shedding flowmeter has been optimized for its standardization. The optimization was achieved by evaluating the linearity of the flowmeters with various bluff bodies. The effect of the installation conditions of the flowmeter on the measurement error and the sensitivity of each flowmeter dimension to the flowmeter output of the flowmeter were also evaluated. A new design method based on theses experimental results has been published in Japan Industrial Standard Z 8766-2001, which will improve the measurement uncertainty significantly and also reduce the manufacturing cost.

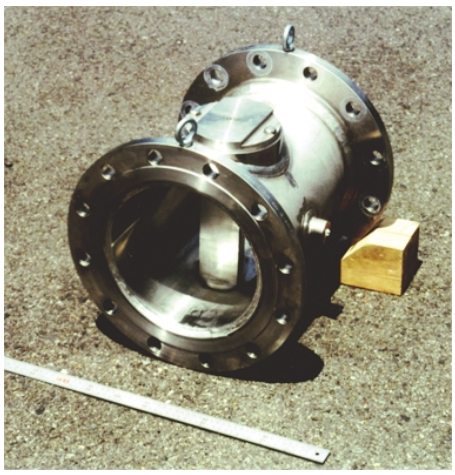


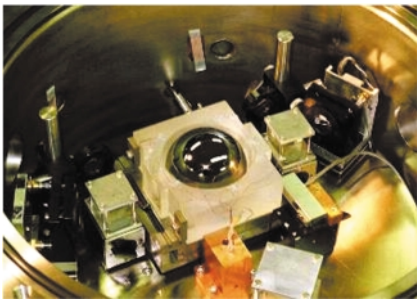
Photo of standardized vortex shedding flowmeter

Determination of the Avogadro Constant

-development of a new atomic mass standard for replacing the kilogram-

Kenichi FUJII
Metrology Institute of Japan
e-mail:
fujii.kenichi@aist.go.jp
AIST Today;
Vol. 1, No. 8 (2001) 12

In the field of basic standards, an accurate value of the Avogadro constant is of primary importance because fundamental physical constants, such as the Planck constant, Boltzman constant, elementary charge, and Josephson constant, are so closely related to the Avogadro constant that its accurate value is indispensable for finding a consistent set of fundamental physical constants used in physics and chemistry. In the field of metrology, kilogram is the only SI base unit still defined by a material artifact. For replacing the present definition of the kilogram with an atomic mass standard, a more accurate value of the Avogadro constant is needed. A determination of the Avogadro constant by the x-ray crystal density (XRCD) method has therefore been conducted at the National Metrology Institute of Japan (NMIJ) of AIST, where the lattice constant, density, and molar mass of a silicon crystal are measured in conformity with the definition of the SI units. The photograph shows an optical interferometer used to measure the diameter of a single-crystal silicon sphere. This interferometer determines the volume of the 1 kg silicon sphere with an uncertainty of 0.1 ppm. From the known value of the lattice constant, it determines the number of atoms in this sphere. These data then lead to an accurate value of the mass of a single Si atom. A research group led by K. FUJII is developing a more accurate density standard for further reduction in the uncertainty of the Avogadro constant. This research is now organized as an international cooperation program with the PTB (Germany), IMGC (Italy), IRMM (EU), CSIRO (Australia), NIST (USA), and BIPM (France) for replacing the kilogram.



Optical interferometer to measure the diameter of a 1 kg silicon sphere with an uncertainty of 1 nm.