U. S. Department of Commerce
Maurice H. Stans
Secretary

National Bureau of Standards
A. V. Astin, Director

Certificate

STANDARD REFERENCE MATERIAL 1512
for
Determination of Dielectric Constant*
1,2-Dichloroethane**

C. G. Malmberg and M. G. Broadhurst

This Standard Reference Material is intended for use in the calibration of cells and test capacitors for the determination of the dielectric constants of liquids. The 1, 2-dichloroethane was obtained from Matheson, Coleman, and Bell of Norwood, Ohio, and was modified by treatment with activated aluminas. It is not purported to be a standard for purity and is not free of traces of water.

The dielectric constant*, E, measured on representative bottled samples was:

at 20 °C	10.6493 ± 0.0008
25 °C	10.3551 ± .0013
30 °C	10.0754 ± .0011

* (This quantity is also called relative permittivity. The values given are relative to vacuum, not to air.)

The uncertainties listed represent the maximum deviation of the observed values from the mean. The standard deviation of the mean of 42 measurements at 30 °C was ± 0.00058 unit. From the relationship

$$E^t = 11.9480 - 7.03068 \times 10^{-2}t + 2.7548 \times 10^{-4}t^2 - 4.22 \times 10^{-7}t^3,$$

where t is the temperature in °C, relative values of the dielectric constant, E, in the range 10° to 40 °C may be calculated without significant error.

The work leading to the certification of this Standard Reference Material was performed in the Polymers Division, Institute for Materials Research, National Bureau of Standards.

Washington, D. C. 20234
July 2, 1969

J. Paul Cali, Acting Chief
Office of Standard Reference Materials

**This material is very toxic and should be handled accordingly. (N. Irving Sax: Dangerous Properties of Industrial Materials, 3rd Edition, Reinhold Publishing Co., New York, N. Y., 1968)

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METHOD OF MEASUREMENT Measurements of the dielectric constant were made in the frequency range 0.75 to 12 kHz using a Type 1615–A capacitance bridge, manufactured by General Radio Co., along with two three-terminal cells designed for "absolute" measurements of the dielectric properties of liquids. An oil bath controlled to within 0.01 °C was used to thermostat the cells. A suitable resistance thermometer and "Mueller" bridge were used to determine the temperature of the bath.

The measured capacities varied with frequency by at most 0.002 percent from 0.75 to 6 kHz. No correction was made for frequency dependence and the 3 kHz capacitance was used to calculate the dielectric constant.

DISSOLVED MOISTURE Gain or loss of dissolved moisture will shift the dielectric constant of this material. Measurements at 25 °C showed an increase in the dielectric constant, E, of 0.87 percent between samples of 1, 2-dichloroethane dried over "Drierite" and samples saturated with water at 21 °C. In normal use (exposure to air of up to 50 percent relative humidity and limited to displacement of air in the cell) the moisture change in this sample can be expected to lead to an uncertainty of less than 0.01 percent.