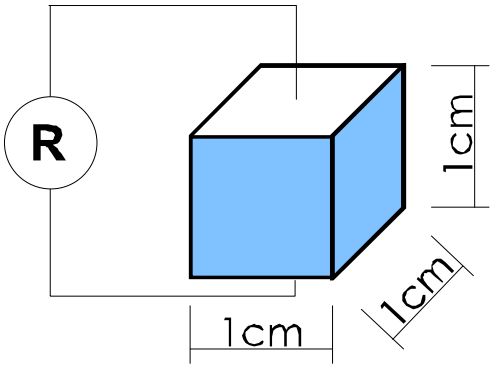
Material Testing: Electrical & Physical
CH- 4057 BASEL

HUNTSMAN

Determination of the Volume Resistivity of Solid Electrical Insulating Materials

Definition: The volume resistivity ρ_d of an insulating material is the volume resistance R(measured) of a material reduced to a cubical unit volume (A and d are area and thickness-dimensions of the test specimen).

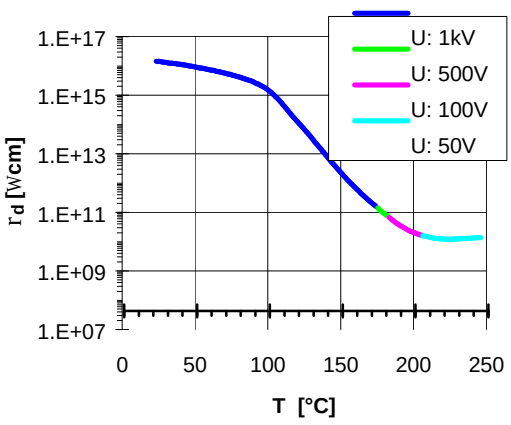


$$r_d = \frac{R \cdot A}{d} [\Omega \cdot cm]$$

Figure 1: Simplified drawing of the test method

The volume resistivity is affected by several factors: the temperature and humidity of the atmosphere around the specimen during conditioning and measurement, the magnitude and time of voltage application, the nature and geometry of the electrodes. There are also surface currents and charge currents which have to be taken into consideration when calculating the value of the volume resistivity.

Typical graph of SiO_2-filled araldite:



When a direct voltage is applied between electrodes in contact with a specimen, the current through it decreases asymptotically towards a steady-state value and is then determined after 1min of electrification even if it has not reached the steady state value. The graph in Figure 2 shows measurements with different voltages. The measuring voltage has to be adjusted to limit the current in order not to heat the specimen electrically.

Figure 2: ρ_d shown as function of temperature