

recent National Physical Laboratory determination at 0°C, but the techniques, now that they are established, should be applicable with little variation to other temperatures over a moderate range.

2. Experimental method

2.1. General

The measurements described in this paper are all based on the identification of the solid-liquid phase transition by means of the change of electrical resistance of the mercury sample. The magnitude of this change—of the order 4 : 1 at 0°C—is such that it can provide an extremely sensitive indication of the proportion of liquid to solid present under any given ambient condition or state of adjustment of the pressure system. This leads to the further advantage that the total quantity of mercury need only be very small, so that volume changes consequent on freezing or melting, which might otherwise affect the equilibrium of the system, are reduced to a completely insignificant level.

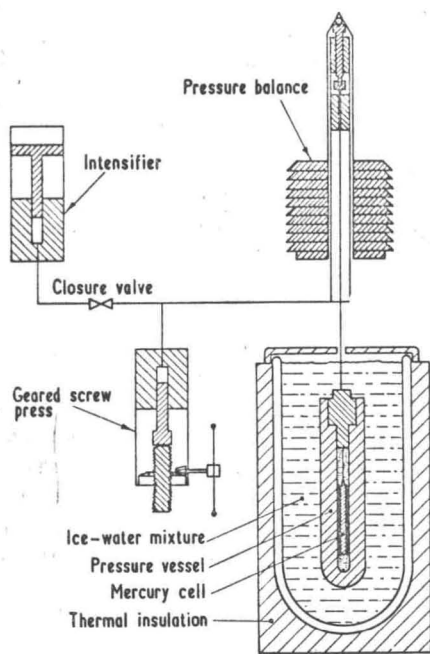


Figure 1. General arrangement of pressure system.

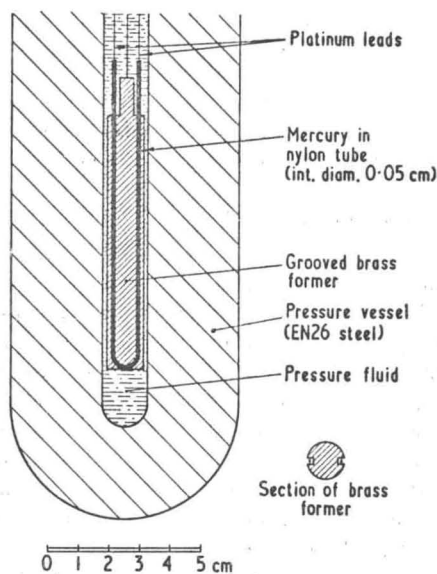


Figure 2. Details of mercury cell.

The general arrangement of the apparatus is shown in figure 1 and an enlarged outline of the mercury cell in figure 2. The pressure in the system was generated by an intensifier capable of producing steady pressures up to 10 000 bar, combined with a highly geared screw press for fine adjustments. The pressure transmitting fluid used was oil of specification DTD 822A, having a kinematic viscosity varying from about 60 to 25 cs over the range 0–20°C at 1 atm. In order to avoid undesirable time effects in pressure transmission the lengths of all connecting lines were reduced to a minimum. The pressure vessel containing the mercury cell was of EN 26 steel, with a ratio of external to internal diameter of about 5 : 1, fitted with ceramic-insulated electrical leads.

The ambient temperature during the measurements was within the range 18–21°C.

2.2. Design of mercury cell

The final design of the mercury cell was reached after trials of several other designs. Initially experiments were made with cells fabricated from Perspex and containing a

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