$1.06\times10^{+4}\ \Omega^{-1}\ cm^{-1}$ at 1 bar and $1.14\times10^{+4}\ \Omega^{-1}\ cm^{-1}$ at 2100 bar.[2] At 1200°C the increase with rising pressure is still small ($1.6\times10^{+3}\ \Omega^{-1}\ cm^{-1}$ at the vaporization pressure of 610 bar and $2.4\times10^{+3}\ \Omega^{-1}\ cm^{-1}$ at 2100 bar). It is only beyond 1200°C that the conductivity becomes strongly pressure-dependent. At slightly supercritical temperatures and at pressure beyond 2000 bars the conductivity is still very close to that of the liquid state around 1200 or 1400°C. The decrease of conductance with temperature at constant pressure, however, becomes very pronounced above 1500°C. This is probably related to the increase of interatomic distances caused by the considerable decrease of density in this region. A quantitative discussion has to be postponed until density data for supercritical mercury are available. An estimation of such density data based on the properties of nonmetallic elements using the principle of corresponding states is not justified.

Thermal ionization of mercury gas at 1700°C and atmospheric pressure at equilibrium conditions can easily be calculated using the ionization potential of 10.4 eV for mercury atoms. Applying an approximate electron-atom collision cross section of 100 square angstroms, a specific conductivity of $10^{-9}\ \Omega^{-1}\ cm^{-1}$ is obtained. The temperature dependence should be positive. The conductivity determined experimentally at 1700°C and 2000 bar is around $2\times10^{-2}\ \Omega^{-1}\ cm^{-1}$, i.e., about 7 orders of magnitude higher than at one bar.

The supposition that this conductivity may originate in insufficient insulation of the alumina parts can be dismissed on the ground of test measurements and also because of the negative temperature dependence

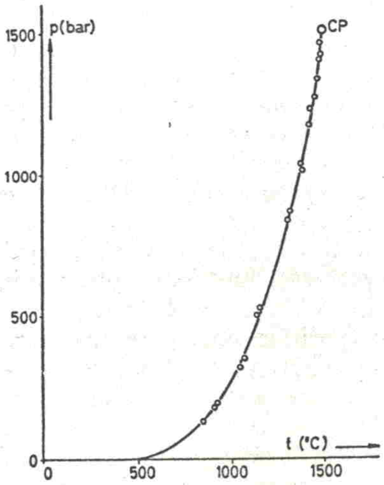


FIG. 1. Vapor-pressure curve of liquid mercury (C.P., critical point; 00, experimental points, this work).

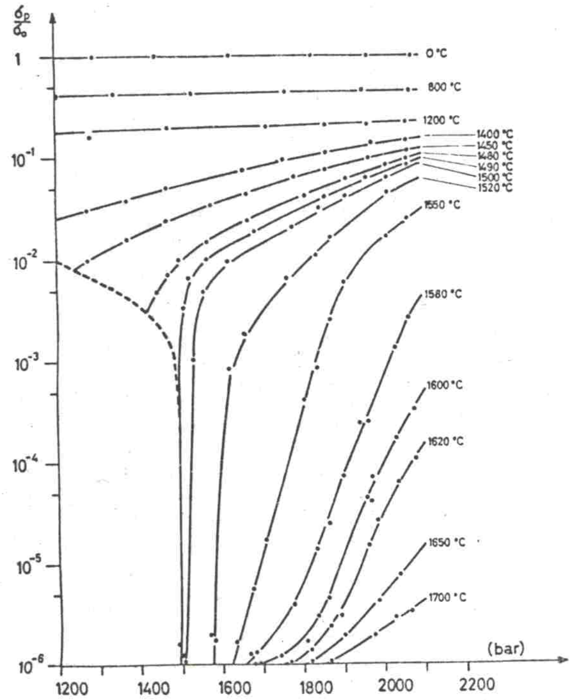


FIG. 2. Relative electrical conductivity of mercury at subcritical and supercritical conditions. $\sigma_p$=specific conductivity at temperature $t$°C and pressure $p$; $\sigma_0$=specific conductivity at $t=0$°C and $p=1$ bar (liquid state); – – – Boundary of the liquid-gas two-phase region.

observed. It cannot be excluded that a certain amount of dimers occur under these conditions, although the dimerization energy of mercury atoms is only about 0.06 eV. It is supposed, that the average interatomic distance is already short enough to cause an appreciable reduction of the barrier impeding the free transfer of electrons.

Quantitative discussion of this phenomenon requires the knowledge of density data. The experimental determination of the mercury density at supercritical temperatures is under way in this laboratory. Details of the conductivity measurements will be published elsewhere.[7]

*Note added in proof*. Experimental determinations of density of mercury have been completed in the meantime and will be given elsewhere.[7] Recently, similar results have been obtained by I. K. Kikoin *et al.*, Zh. Experim. i Teor. Fiz. **49**, 124 (1966) [English transl.: Soviet Phys.—JETP **22**, 89 (1966)].

[7] F. Hensel and E. U. Franck, Ber. Bunsenges. Phys. Chem. **70**, (1966).