Summary of Super Pressure Report

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(1) Sodium silicate-water system studied at pressures to 104,000 atmospheres at 600° C. Dense silica was only material formed at pressures above 33,000 atmospheres. However, at pressures above 60,000 atmospheres the dense silica tends to grow in clusters containing four crystals.

(2) The melting point of Germanium has been measured as a function of pressure to 95,000 atmospheres. The melting point drops linearly from 940° C at 1 atmosphere to about 640° C at 95,000 atmospheres.

(3) The ability of pyrophyllite (Tennessee Lava or Wonderstone) to maintain pressure within itself after the pressure sustained by the hydraulic press is released was clearly demonstrated (and the extent of the phenomenon measured) in the Germanium melting point experiments. Corroboration of the effect was obtained when it was shown that dense silica (which requires 33,000 atmospheres for formation at 600° C) could be grown at a press load corresponding to a pressure of only 20,000 atmospheres if the sample (contained in the pyrophyllite) had previously been subjected to a pressure of 50,000 atmospheres. The pre-loading to 50,000 atmospheres is performed at room temperature, the press load is released to 20,000 atmospheres and then the sample is heated to 600°C. The experiment shows that under conditions the stone is maintaining 13,000 atmospheres of its own accord. At higher pressures, this "confining strength" is as great as 25,000 atmospheres. The confining strength of 25,000 atmospheres has held undiminished for 40 minutes when the temperature inside the sample was 560°C. This indicates that the phenomenon is undoubtedly a long-lived one.

(4) Attempts to melt graphite at 102,000 atmospheres at estimated temperatures up to 5000°C and at 60,000 atmospheres at estimated temperatures up to 7000°C were made. I was not able to determine if the graphite melted under these conditions.

(5) The electrical resistance of pyrophyllite (wonderstone) at temperatures to 1800°C at pressures near 10,000 and 50,000 atmospheres has been measured. At both pressures, the resistance falls slowly from essentially infinity at room temperature to the order of 100 ohm cm near 700°C. Above 700°C the resistance falls more rapidly. At 1800°C the resistance at both pressures is of the order of 10 ohm cm. This is about 10,000 times as resistive as graphite at 1800°C and about a million times as resistive as most metals. For most purposes, then, pyrophyllite is still an electrical insulator at these pressures and temperatures.

(6) A technique for placing electrical leads into the high-pressure, high-temperature zone of the "belt" apparatus has been developed. The arrangement is such that the leads do not "pinch-off" or "blow-out" at pressures to 100,000 atmospheres. This technique has made it possible to obtain the foregoing results and opens a wide field for future exploration.