17 cm). The crucible was then placed into a furnace at 300°C (melting point 276.9°C) for two days. The temperature was decreased to 188°C at a rate of 0.76°C/h. The temperature was further decreased to 130°C at a rate of 1.02°C/h near the Curie point (163.3°C). Below 130°C, the sample was cooled naturally until $NaNO_2$ crystal was produced. The ingot of this crystal was cleaved. There the crystal was cut in the direction normal to the b-axis by use of a wet string inserted into a {1, 0, 1} cleavage. The plate with an area of 30 to 40 mm^2 was then carefully hand-lapped until its thickness reached 0.20 mm by using No. 1500 Al_2O_3 powder containing alcohol. Then the disk was dried in the 100°C temperature bath and was applied by silver paste as an electrode. The sample thus obtained was b-plate.

(3) $CaCO_3$

Since $CaCO_3$ has a very high melting point, single crystals of natural calcite were used. After it was confirmed by polarizing microscope that the crystal was clean it was cut in the direction normal to the c-axis using a cleaved surface and then hand-lapped by using No. 1500 Al_2O_3 powder until the thickness became 0.16 mm. The sample thus produced has an area of 40 to 50 mm^2.

2.3 High-pressure apparatus

We have constructed a high-pressure apparatus employing a liquid-solid hybrid system using tungsten carbide. The high-pressure apparatus which is capable of producing above 20 kbar must meet the following conditions:

(a) The lead wires connecting the sample and Q meter via gaskets must not maintain high resistivity against high pressure. Further, the stray capacitance between wires must be constant.

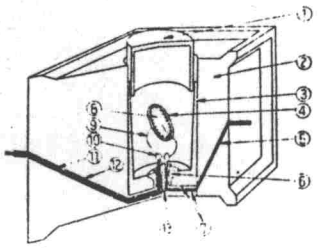
(b) The pressure cells must be constructed such that the liquid medium is completely shielded.

(c) The gasket at the lead-wire outlet must have sufficient viscosity such that the lead wire is not disconnected.

In the following are described two types of high-pressure apparatus, i.e., type a (Fig. 1) and type b (Fig. 3). Table 1 summarizes the features of these apparatus.

(1) Type-a apparatus

Tungsten-carbide anvils are attached to the ends of each ram of a cubic press which can withstand the maximum pressure of 600 t. The anvil surface is a square with a 20-mm side and presses each of 6 surfaces of the pressure cell. As seen in Fig. 1, the pressure cell is a cubic pyrophyllite (② 23 mm in side length) with fin-shaped pregaskets in which a vaseline-filled cylindrical capsule is inserted. The capsule is composed of a stainless steel body ③ and a cap ①.



① Capsule, ② Cubic pyrophyllite, ③ Capsule body, ④ Sample, ⑤ Copper wire, ⑥ Pyrophyllite cone, ⑦ Thin pyrophyllite plate, ⑧ Electrode, ⑨ Enamel lead wire, ⑩ Soldering, ⑪ Nichrome wire, ⑫ Teflon tube, ⑬ Epoxy resin.

Fig. 1. Main part of type-a high pressure apparatus.

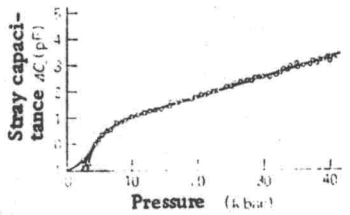
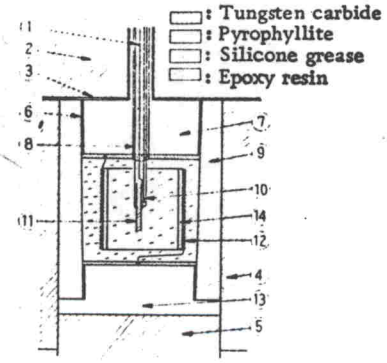


Fig. 2. Pressure dependence of stray capacitance ΔC_S of positive lead.



① Al_2O_3 ceramic insulating tube, ② End plate, ③ Mica plate ④ Pressure vessel (cylinder), ⑤ Pressure vessel (piston), ⑥ Lead foil, ⑦ Upper cap, ⑧ Enamel wire, ⑨,⑩ Pyrophyllite cylinder, ⑪ Alumel-chromel thermocouple, ⑫ Sample ⑬ Manganin winding, ⑭ Lower cap.

Fig. 3. Main part of type-b pressure apparatus (under high pressure).

(i) The inner and outer diameters of the capsule body are 12 and 13 mm, respectively, and the capsule length and inner depth are 18 and 15 mm, respectively. The capsule inner wall is tapered at 1° with respect to the axial direction. (ii) The inner and outer diameters are 11 and 12 mm and the capsule length and depth are 9 and 8 mm, respectively.