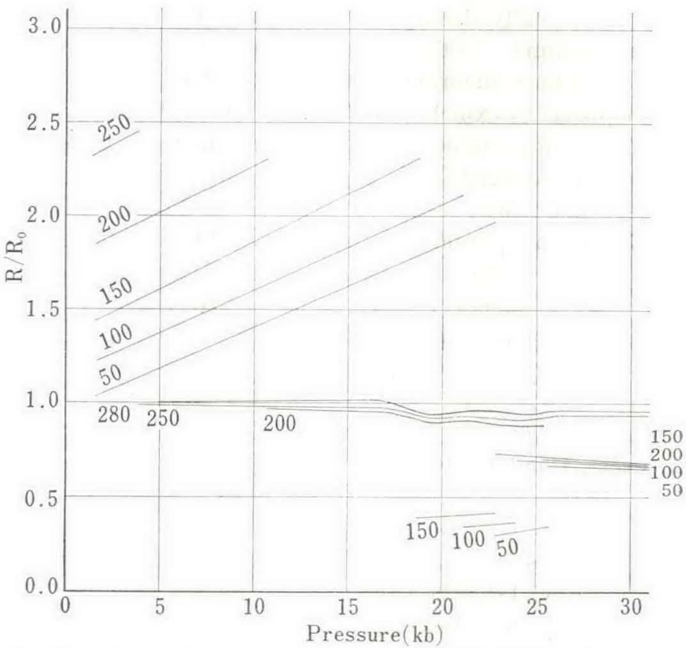

Fig. 7. The electrical resistances of bismuth as functions of pressure and temperature in terms of that at room temperature and 2.5 kb, R_0 as unity.

have already observed the electrical resistances of the solid bismuth up to 30 kb and 150°C. We need not have considered the effects of the penetrations in this case and have the correct values. Therefore, comparing the observed values in these two cases (one is up to 150 and the other up to 280°C), we can modify the directly observed electric resistance of the liquid bismuth. However we abandoned the observed values of the runs in which the penetrations had been less than 15%. After all, we used the values in the 5 runs of about had been less than 15%. After all, we use dthe values in the 5 runs of about 40 runs to arrange the experimental results. Fig. 7 shows the results obtained in such a manner as described above. The values of the electrical resistances in terms of that at room temperature and 2.5 kb as unity are given in Fig. 7.

The characterstic change in the pressure range from 15 kb to 25 kb seems to be due to the solid phases and to support the Rapoport's view. The values obtained in our experiments were slightly higher than those of Bridgman[19]. But this may be due to the difference of experimental assemblies, in fact, the sample holders were extended in the radial direction by about 0.1 mm after every run.

The two species model is rather vague in its physical meanings. In fact, Rapoport himself had used such words as "in the broad sence of the word" in the definition of the model. Moreover, if a species is defined as Rapoport said, there are no pairs of different ions in the liquid and the quasichemical approach loses the physical meanings for the liquid. Nevertheless the several phenomena under high pressure could be explained or derived successfully by using the model. Especially the greatest success may be in the explanation of the melting curves maxima. In the case of bismuth, this simple model cannot be applied, because the phase diagram is too complicated, that is, more than two species may be required to explain the phenomena of bismuth under high pressure. However this is not a important fault of the model, because the important view of Rapoport is condenced as "a liquid consists of species". The observed values of the electrical resistances of bismuth seem to support the Rapoport's view and Further, if the predicted pressures (30 kb for cesium and 5 kb for tellurium) at which the maxima of the entropy changes of melting takes place will be verified by experiments, it may be concluded that the Rapoport's view has a certain essencial truths for a liquid.

References

1) See L. Knopoff, "Advance in High Pressure Research", Vol. 1, Chap. 5, Academic Press, London (1966)
2) ibid.
3) ibid.
4) A. Kraut and G. C. Kennedy, Phys. Rev. Letters, 16, 608 (1966)
5) M. Ross, Phys. Rev. 184, 233 (1968)
6) E. Rapoport, Phys. Rev. Letters, 19, 345 (1967)
7) E. Rapoport, J. C. P., 46, 2891 (1967)
8) E. Rapoport, J. C. P., 48, 1433 (1968)
9) H. T. Hall, L. Merrill and J. D. Barnett, Science, 146 1297 (1964)
10) P. W. Bridgman, "Collected Experimental Papers", 136-353, Harvard Univ. Press, Cambridge, Massachusetts (1964)
11) C. J. Smithells, "Metals Reference Book", Butter Worths, London (1967)
12) A. Jayaraman, R. C. Newton and J. M. McDonough, Phys. Rev., 159, 527 (1967)
13) S. M. Stishov, N. A. Tikhomirova and E. Y. Tonkov, J. E. T. P. Letters, 4, 111 (1966)
14) W. Klement, Jr., A. Jayaraman and G. C. Kennedy, Phys. Rev., 131, 632 (1963)
15) A. H. Wilson, "The Theory of Metals", 2d ed., p.63, Cambridge Univ. Press, (1965)
16) J. C. Jamieson, A. D. Lawson and N. D. Nachtrieb, Rev. Sci. Instr. 30, 1016 (1959)
17) See Ref. (14)
18) P. C. Sharrah, J. I. Petz and R. F. Kruh, J. C. P., 32, 241 (1960)
19) P. W. Bridgman, "Collected Experimental Papers", 38-114, Harvard Univ. Press, Cambridge, Massachusetts (1964)
20) "International Critical Table", McGraw Hill, New York (1933)
21) H. Endô, "Kinzokuno Butzuritekiseishitzu", Nihonbutzurigakkai, Shôkabô, Japan (1969)