

TABLE II
Elastic constants in 10^{11} dynes/cm.²

Substance	C_{11}	C_{12}	C_{44}	d_{11}	d_{12}	d_{44}	d_{45}
NaCl ..	4.877	1.232	1.269	4.877	1.34	1.269	1.16
KCl ..	4.038	0.663	0.628	4.038	0.779	0.628	0.512
KBr ..	3.455	0.56	0.507	3.455	0.655	0.507	0.412
NaBr ..	3.87	0.97	0.97	3.87	1.22	0.97	0.72
LiF ..	11.9	5.38	5.34	11.9	4.5	5.34	6.22
MgO ..	28.76	8.74	15.14	28.76	11.27	15.14	12.61
AgCl ..	6.05	3.64	0.624	6.05	3.482	0.624	0.782
Diamond ..	95	39	43	95	35.9	43	46.1
Ge ..	12.88	4.825	6.705	12.88	4.04	6.705	7.49
Si ..	16.56	6.386	7.953	16.56	6.56	7.953	7.78
ZnS ..	10.79	7.22	4.12	10.79	6.17	4.12	5.17
CaF ₂ ..	16.6	4.87	3.58	16.6	4.29	3.58	4.16
Al ..	10.56	6.39	2.853	10.56	6.29	2.853	2.953
Cu ..	16.92	12.25	7.55	16.92	12.81	7.55	6.99
Ni ..	25.26	15.51	12.3	25.26	16.01	12.3	11.8
Ag ..	12.4	9.34	4.61	12.4	8.89	4.61	5.06

soluble in water, C_{12} is less than d_{12} and likewise d_{45} is less than d_{44} . This regularity of behaviour taken in conjunction with the reliability of the data in these cases makes it clear that these differences are real and justify us in concluding that the elastic behaviour of cubic crystals cannot be expressed in terms of three constants, but needs four. Diamond, germanium, zinc blende and fluorspar also exhibit a parallel behaviour which is the reverse of that shown by the four water-soluble alkali-halides. In their cases, C_{12} is decidedly greater than d_{12} , while *per contra* d_{44} is less than d_{45} and these differences are numerically more striking than in the case of the alkali-halides. Magnesium oxide for

which the data are reliable exhibits a noteworthy behaviour; the differences between C_{12} and d_{12} and likewise between d_{44} and d_{45} are in the same sense as in the alkali halides but proportionately much larger. Differences of the same order of magnitude but in the opposite sense is shown by lithium fluoride. In the case of the metals crystallizing in the face-centred cubic system, we also find differences between C_{12} and d_{12} and between d_{44} and d_{45} , but they are not always in the same sense. This is a feature which need not surprise us in view of the very great differences exhibited by these metals in other respects.

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RADIATION EFFECTS IN COVALENT AND IONIC CRYSTALS

IN a paper presented at the Geneva Conference on the Peaceful Uses of Atomic Energy, J. H. Crawford, Jr., of the Oak Ridge National Laboratory, U.S.A., reports that the physical properties of many non-metallic solids, such as diamond, quartz and various crystalline salts undergo extensive changes when these materials are exposed to the high energy radiations emanating from nuclear reactors. Changes in colour, magnetic behaviour, density and crystal structure as indicated by X-ray studies have been observed.

For example, diamond specimens take on a dark, opaque appearance and their density decreases by 4% after extended bombardment

with high energy neutrons which result from the fission of U235 atoms. Once damaged to such an extent, annealing at high temperatures (which usually restores material to its initial conditions) can no longer produce a colourless crystal. Exposure of natural crystalline quartz to reactor radiations produces, relatively speaking, an enormous expansion of the crystals. As much as a 14% decrease in density has been observed. After exposure, X-ray studies indicate that the normal, ordered array of atoms which make up the quartz structure has been completely destroyed and the material is essentially structureless like a glass.