A. WORK COMPLETED

An x-ray diffraction study by Robert L. Mozzi of the structure of vitreous SiO$_2$ has now been completed. This work has utilized new advances in experimentation and theory, and represents the most detailed study, thus far, of the structure of a simple glass. The first peak in the radial distribution curve has a position giving a silicon-oxygen distance of 1.62Å, and an area giving a coordination of 4 oxygens about a silicon. The second peak gives an oxygen-oxygen distance of 2.65Å. Both of these peaks have the same width as the theoretical pair functions, and hence there is very little variation about the two distances 1.62Å and 2.65Å. The ratio $2.65/1.62 = \sqrt{8}/3$ corresponds to the exact tetrahedral coordination of 4 oxygens about a silicon. The position of the third peak gives a silicon-silicon distance of 3.15Å. From the ratio $3.15:1.62$, an average Si-O-Si bond angle of 153° is obtained. The third peak is considerably broader than the theoretical pair function, however, thereby indicating a variation of ±20° about the average value of 153° for the Si-O-Si bond angle. This variation indicates the randomness in the glass structure as compared with the crystalline forms of SiO$_2$. The results can be interpreted equally well in terms of a random network with the preceding restrictions, or in terms of a paracrystalline form of cristobalite.

Further details may be found in Mozzi's thesis.¹

This work is now being prepared for publication. The project will terminate in January 1968.

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References


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