World Bulletin of Social Sciences (WBSS)
Available Online at: https://www.scholarexpress.net
Vol. 4, November - 2021
ISSN: 2749-361X

USING THE TECHNOLOGICAL PROPERTIES OF MINERAL GLASSES

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Article history:

Received: August 28 2021
Accepted: September 26th 2021
Published: November 11th 2021

Abstract:

The properties of glass as an amorphous substance, on the one hand, endowing it with fragility, what is its disadvantage and inapplicability for the manufacture of, for example, instruments that require increased strength (the former disadvantage is now in some cases, and a number of technological techniques have been overcome), on the other hand, this absence of a crystal lattice gave it an advantage, which is the reason that no metal scalpel can still be compared with the first medical, surgical instruments in their sharpness, sharpening capabilities

Keywords: Glass, Sharpening, Materials, Strength, Molecular Level.

Natural glass, being one of the first natural materials, which was very widely used in everyday life, both as a tool, and as part of various types of weapons (knives, arrowheads, spears, and so on), - for making jewelry and other household items— - and as various elements of rituals, for example, Aztec and Mayan; - due to its structure, it also possesses paradoxical, seemingly properties that were used by the same Aztecs who made unique tools.

It is the properties of glass as an amorphous substance that, on the one hand, endows it with fragility, which is its disadvantage and inapplicability for the manufacture of, for example, instruments that require increased strength (the former disadvantage is now in some cases, and a number of technological techniques have been overcome), on the other hand, this absence of a crystal lattice gave it an advantage, which is the reason that no metal scalpel can still be compared with the first medical, surgical instruments in their sharpness, sharpening capabilities. The working part of the latter (chamfer) can be sharpened to a certain limit — in the future it is almost impossible to get rid of the "saw", while there is no such threshold, for example, in obsidian scalpels — the absence of a crystal lattice allows them to be sharpened to the molecular level, which gives an undeniable advantage in microsurgery, besides they are not subject to corrosion. This example, although related to glassy minerals, is very indicative for understanding such a structural property of glass as amorphousness. But now these properties are also used in the creation of precision instruments made of artificial glass.

The term "glass structure" implies a description of two closely related, but often considered independently aspects - the geometry of the relative arrangement of atoms and ions that make up glass, and the nature of chemical bonds between the particles forming it. As already noted, the structure of the glass corresponds to the structure of the liquid in the glass transition interval. This determines that the issues of the structure of glass-forming melts and glasses are most closely related to each other. Any achievement in the study of the structure of liquids and melts creates additional opportunities for the development of the doctrine of the structure of glass and vice versa.

The development of the idea of the structure of glass passes through hypotheses that explain experiments, to theories that take shape mathematically and assume quantitative verification in an experiment. Thus, the understanding of the structure of glassy substances (and partially liquid) is due to the perfection of research methods and mathematical apparatus, technical capabilities. The conclusions allow us to further develop the theory of the structure of glass and similar amorphous substances by improving the methodology.

Strictly speaking, experimental methods of studying the structure of glasses are less than a hundred years old, since only the technique of X-ray analysis, which really gives a real picture of the structure of matter, can be attributed to such in its entirety about the structure of glass. Among the first who started using X-ray scattering to analyze the structure of glasses were the students of academician A. A. Lebedev, who in 1921 put forward the so-called "crystallite" hypothesis of the structure of glass, and in the early 1930s, for the purpose of research by this method, was the first in the USSR to organize a group in his laboratory, headed by E. A. Poray-Koshits and N. N. Valenkov.

However, the so-called model methods play a primary role not only in the theoretical aspect of the issue, the assessment of thermodynamic characteristics, but also in the implementation of the

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Vol. 4, November - 2021
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experiment, in understanding the methodology of its formulation, in evaluating and agreeing with the theory of its results. These include the EMF method, the electrode method, the mass spectrometric method and the nuclear magnetic resonance method. And if the first was used already at the initial stages of the development of electrochemistry, the second owes its origin to the glass electrode, which has found full use both as an object of research (the material of the glass electrode) and as a device that provides information not only about the processes in the substance of which it consists, but also indirectly about its structure. The electrode method was proposed in the early 1950s by M. M. Schultz. The American physicist F. Bray was among the first who began to study glass by NMR. Now the arsenal of model methods has been replenished thanks to the use of confocal optical microscopy, which allows to observe the location of micrometer colloidal particles volumetrically. The atoms forming the glass are experimentally imitated by colloidal gel particles suspended in a polymer matrix.

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ISSN: 2749-361X

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