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ENERGY EVALUATION OF ENSURING THE SAFETY OF BUILDINGS AND STRUCTURES FROM SEISMIC AND FIRE IMPACTS

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Abstract
The necessity of ensuring the safety of buildings and structures has made it possible to obtain interesting results by simplifying the surface approach. It was determined that for the self-evolution of the system, the probability of transition from a less probable state to a more probable state in the case of a more ordered arrangement of its molecules is higher. It was shown that if the environment has the necessary conditions for this, the probability of such a transition increases further.

Keywords: Proteology, fire seismology, pyrolysis, wollastonite, entropy, nanosurface.

Introduction

It is important to consider that the object being studied for ensuring the seismic and fire safety of buildings and structures is a complex system [1-4]. Proteology has given scientists the opportunity to develop general universal algorithms and mechanisms for protecting various systems [5]. For example, A. Fleming proposed ideas according to which all living organisms place protective mechanisms on all their surfaces. Armed only with the basics of proteology, he concluded that the adaptation of microorganisms to a single type of vaccine forces the evolutionary development of the organism's defense mechanisms. As a result, another previously unappreciated protective mechanism was discovered, namely, penicillin, which saved the lives of millions of people from mold (fungus) [6-7].

In this regard, the mechanism we propose for ensuring the seismic and fire safety of buildings and structures is fully aligned with the methodology for ensuring the safety of protected objects, as well as a small section of proteology that covers the field of ensuring the safety of technical systems.

Materials and Methods

The above-mentioned aspects provide an opportunity to strengthen our argument about the proposal for a new scientific direction called "Fire Seismology." In this regard, research has been conducted from the perspective of the intersection of fire safety and seismology [7-10]. During a fire, buildings and structures exposed to the effects of fire are typically considered as

complex systems, and therefore, the approach to ensuring safety must be adequate. In the course of our work, we decided to simplify the complex system to the nanosurface level. Investigating the material substance at the nanosurface and determining that its crystal lattice has changed allowed us to perform several theoretical actions and calculations. The study of the fire-related properties of mineral-based construction materials made from local raw materials, depending on their crystalline level, revealed another aspect of ensuring safety. Aspects such as pyrolysis, stretching, breaking, and the fragmentation of the material address the question of the system's transition from a more probable to a less probable state. Therefore, in such a situation, it is necessary to recall the entropy of the system. Entropy is the energetic evaluation of the probability of reality.

$$W = TS, \tag{4.6}$$

In this case, T is the thermodynamic temperature;
S is the entropy of the system;
W is the thermodynamic probability of the state.
In other words, TS represents the internal energy that is required for the system to transition from a more probable state to a less probable state.

Two cubes of the same volume were taken by us, one of which had a material added that promotes better crystallization, specifically two pieces of wollastonite mineral were placed, with only one of them being more crystalline than the other. The main difference between them can be explained by the degree of order (the long- and short-range order of the microstructure). Both pieces exhibited in a 1 cm³ volume cube. ($V_1=V_2=1см^3$).
In each cube of wollastonite, macromolecules are arranged in absolutely unpredictable conformations. The number of such conformations is undoubtedly infinite. However, even in the amorphous and crystalline state, after the material has been melted, the molecules will still have limitations on which conformations they can adopt. Therefore, we conditionally assume that the number of molecules in each state is equal to N.
When heating and vibrational effects act together, initially, the volumes of these two cubes may change to the V_3 state. It can be stated that the transition from state V_1 to state V_3, or from state V_2 to state V_3, is only ensured by the utilization of energy, and the energetic evaluation of the probability of transition between these states needs to be considered. However, our goal is to consider the difference in the energetic evaluations of the probabilities between these two transitions. For this purpose, it is deemed appropriate to consider such transitions at the molecular level, more precisely, at the molecular interval level. Each of the states V_1, V_2, and V_3 will have different numbers of conformations of wollastonite molecules (V_n^W). Therefore, we will write the probabilities of performing each of these states.

$$V_3^W = W_3 \text{ – final state probability}$$
(after the combined effect of vibro- and thermal effects), (4.7)

$$V_2^W = W_A \text{ – amorphous state probability,} \tag{4.8}$$

$$V_2^W = W_K \text{ – The Probability of the Crystalline State,} \tag{4.9}$$

In this situation, the efficiency of the transition from one state to another, specifically to the molten state, for both cubes can be written as follows:

$$W_K / W_3 = (V_K / V_3)^N \quad (4.10)$$

$$W_A / W_3 = (V_A / V_3)^N . \quad (4.11)$$

here: V_3 – volume occupied by cubic molecules in the swollen state;
$V_к$ – cubic volume for the crystalline state;
V_A – cubic volume for the amorphous state.
Now we have $W_K \Rightarrow W_3$ ва $W_A \Rightarrow W_3$ It is possible to answer the question of what is the difference between the transitions. This can be achieved by dividing the first ratio by the second ratio and performing a simple arithmetic operation.

$$\frac{W_K / W_3}{W_A / W_3} = \frac{W_K}{W_A}. \quad (4.12)$$

6.15) and (6.16) have the following formula due to the similarity of the formulas

$$W_K / W_A = (V_K / V_A)^N . \quad (4.13)$$

Results

It follows from this that to explain the energetic difference between two different transitions, we can divide the number of methods implemented in the first cube by the number of methods implemented in the second cube.
If this ratio is equal to "1," then it is not necessary to calculate the energetic difference between the transition of the amorphous cube to the molten state, as compared to the crystalline wollastonite cube. $W_K / W_A = (V_K / V_A)^N = 1,$ (6.14)
That is, for the cube with a higher degree of crystallization, the same amount of energy is required to transition it to the molten state as is needed to melt the cube composed of wollastonite's most amorphous structure.
To obtain more precise results, it is necessary to consider the density. That is, it is required to determine the mass-to-volume ratio.

$$\rho = m / v, \quad (4.15)$$

In this case, ρ is the density of the cube material; m and v are the mass and volume of the cube. Since the volume is equal to 1 cm³, it was found that drawing 100 cubes of the same volume for the first (more crystallized structure) cube results in a mass of M = 32.6 milligrams, and for the second (amorphous structure) cube, the mass is M = 30.1 milligrams. The calculation of the densities gives the following ratios:

$$\rho_K \rho_A \approx 1,08. \quad (4.16)$$

From this ratio, it follows that, for a constant mass, the ratio of the densities of the cubes is given as follows:

$$\rho_K / \rho_A = \frac{M / V_K}{M / V_A} = \frac{V_A}{V_K} \approx 1,08. \quad (4.17)$$

That is, the ratio is greater than one. (32.6 / 30.1 = 1.0830564784) Substituting this value into formula (6.19), we get the following:

$$W_K / W_A = (V_K / V_A)^N > 1. \quad (4.18)$$

Conclusion

As we can see, simplifying the necessity of ensuring the safety of buildings and structures to the nanosurface level has provided the opportunity to obtain interesting results. As indicated above, it was determined that for the self-evolution of the system, the probability of transition from a less probable state to a more probable state is higher when its molecules are in a more ordered state. If the environment provides the necessary conditions, this probability becomes even greater.

References

[1]. Abobakirova Z. A., Bobofozilov O. Ispolzovanie shlakovых vyajuщix v konstruktsionnых solestoykix betonax //international conferences on learning and teaching. – 2022. – T. 1. – №. 6..

[2]. Abobakirova Z. A., Bobofozilov O. Remont betonnogo pola–vidы povrejdeniy i merы po ix ustraneniyu //international conferences on learning and teaching. – 2022. – t. 1. – №. 10. – s. 32-38..

[3]. Abobakirova, Z. A. (2021). Regulation Of The Resistance Of Cement Concrete With Polymer Additive And Activated Liquid Medium. The American Journal of Applied sciences, 3(04), 172-177.

[4]. Asrorovna A. Z. Effects Of A Dry Hot Climate And Salt Aggression On The Permeability Of Concrete //The American Journal of Engineering and Technology. – 2021. – T. 3. – №. 06. – S. 6-10.

[5]. Abobakirova Z. A. Regulation Of The Resistance Of Cement Concrete With Polymer Additive And Activated Liquid Medium //The American Journal of Applied sciences. – 2021. – T. 3. – №. 04. – S. 172-177.

[6]. Akhrarovich A. X., Mamajonovich M. Y., Abdugofurovich U. S. Development Of Deformations In The Reinforcement Of Beams With Composite Reinforcement //The American Journal of Applied sciences. – 2021. – T. 3. – №. 5. – S. 196-202.

[7]. Goncharova N. I., Abobakirova Z. A., Kimsanov Z. Technological Features of Magnetic Activation of Cement Paste" Advanced Research in Science //Engineering and Technology. – 2019. – T. 6. – №. 5.

[8]. Kimsanov Z. O., Goncharova N. I., Abobakirova Z. A. Izuchenie texnologicheskix faktorov magnitnoy aktivatsii sementnogo testa //Molodoy uchenыy. – 2019. – №. 23. – S. 105-106.

[9].Goncharova N. I., Abobakirova Z. A. RECEPTION MIXED KNITTING WITH MICROADDITIVE AND GELPOLIMER THE ADDITIVE //Scientific-technical journal. – 2021. – T. 4. – №. 2. – S. 87-91

[10].Goncharova N. I., Abobakirova Z. A., Mukhamedzanov A. R. Capillary permeability of concrete in salt media in dry hot climate //AIP Conference Proceedings. – AIP Publishing LLC, 2020. – T. 2281. – №. 1. – S. 020028.

[11].Umarov, S. A. (2021). Development of deformations in the reinforcement of beams with composite reinforcement. Asian Journal of Multidimensional Research, 10(9), 511-517.
[12].Умаров, Ш. А. (2021). Исследование Деформационного Состояния Композиционных Арматурных Балок. TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI, 1(6), 60-64.
[13]. Abdugofurovich, U. S. (2022). BONDING OF POLYMER COMPOSITE REINFORCEMENT WITH CEMENT CONCRETE. Gospodarka i Innowacje., 24, 457-464.
[14]. Абдуллаев, И. Н., Умирзаков, З. А., & Умаров, Ш. А. (2021). Анализ Тканей В Фильтрах Систем Пылегазоочистки Цементного Производства. TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI, 1(6), 16-22.
[15]. Davlyatov, S. M., & Kimsanov, B. I. U. (2021). Prospects For Application Of Non-Metal Composite Valves As Working Without Stress In Compressed Elements. The American Journal of Interdisciplinary Innovations Research, 3(09), 16-23.
[16]. Умаров, Ш. А., Мирзабабаева, С. М., & Абобакирова, З. А. (2021). Бетон Тўсинларда Шиша Толали Арматураларни Қўллаш Орқали Мустаҳкамлик Ва Бузилиш Ҳолатлари Аниқлаш. TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI, 1(6), 56-59.
[17].Тошпулатов, С. У., & Умаров, Ш. А. (2021). ИНСТРУМЕНТАЛЬНО-УЧЕБНО-ДИНАМИЧЕСКИЕ ХАРАКТЕРИСТИКИ СРЕДНЕЙ ШКОЛЫ И КОНСТРУКТИВНЫЕ РЕШЕНИЯ СРЕДНЕЙ ШКОЛЫ№ 2 Г. ФЕРГАНЫ. TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI, 1(6), 10-15.
[18]. Mamazhonovich, M. Y., Abdugofurovich, U. S., & Mirzaakbarovna, M. S. (2021). The Development of Deformation in Concrete and Reinforcement in Concrete Beams Reinforced with Fiberglass Reinforcement. Middle European Scientific Bulletin, 18, 384-391.
[19]. Набиев, М. Н., Насриддинов, Х. Ш., & Кодиров, Г. М. (2021). Влияние Водорастворимых Солей На Эксплуатационные Свойства Наружные Стен. TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI, 1(6), 44-47.
[20]. Hasanboy o‘g‘li, A. A. (2022). Stress Deformation of Flexible Beams with Composite Reinforcement under Load. American Journal of Social and Humanitarian Research, 3(6), 247-254.
[21]. угли Ахмадалиев, А. Х., & угли Халимов, А. О. (2022, May). КОМПОЗИТНОЕ УСИЛЕНИЕ ИЗГИБАЮЩИЙ БАЛК ПОД НАГРУЗКОЙ. In INTERNATIONAL CONFERENCES ON LEARNING AND TEACHING (Vol. 1, No. 7, pp. 409-415).
[22].Сон, Д. О., & Халимов, А. О. (2021). УПРАВЛЕНИЕ МЕТРОЛОГИЧЕСКИМИ РИСКАМИ КАК ОСНОВА ДЛЯ УВЕЛИЧЕНИЯ КАЧЕСТВА ПРОДУКЦИИ. Экономика и социум, (2-2), 202-210.
[23]. Бахромов, М. М. (2020). Исследование сил негативного трения оттаивающих грунтов в полевых условиях. Молодой ученый, (38), 24-34.
[24]. Бахромов, М. М., & Раҳманов, У. Ж. (2020). Проблемы строительства на просадочных лессовых и слабых грунтах и их решение. Интернаука, (37-1), 5-7.
[25]. Mirzaeva, Z. A. (2021). Improvement of technology technology manufacturing wood, wood with sulfur solution. Asian Journal of Multidimensional Research, 10(9), 549-555.
[26]. Мирзаева, З. А. К., & Рахмонов, У. Ж. (2018). Пути развития инженерного образования в Узбекистане. Достижения науки и образования, 2(8 (30)), 18-19.

[27].Абобакирова, З. А., & кизи Мирзаева, З. А. (2022, April). СЕЙСМИК ҲУДУДЛАРДА БИНОЛАРНИ ЭКСПЛУАТАЦИЯ ҚИЛИШНИНГ ЎЗИГА ХОС ХУСУСИЯТЛАРИ. In INTERNATIONAL CONFERENCES ON LEARNING AND TEACHING (Vol. 1, No. 6, pp. 147-151).