

Joint Event

21st International Conference and Exhibition on
Materials Science and Chemistry

33rd Annual European Pharma Congress

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The effect of MXenes layers in solid multicomponent functional composites based on oxygen-free materials

Statement of the Problem: Multicomponent composites from advanced ceramics are obtained in multifactor technological processes. As a rule, the correlation "technological parameter-property" is quite illusory. This led to great risks of obtaining a composite with inappropriate properties. Our development of the process of creating 3-D macrostructure objects with a 2-D functional zone revealed a zone of increased efficiency, the explanations of which were too controversial. At the same time, the number of elements with high energy-saving properties was approximately 50% of the total number. But in 2011, the theory of MXenes appeared which, in combination with the theory of percolation, is able to explain the true nature of the high efficiency zone. The purpose of this study is to describe the experience of researching a large number of images of the microstructure of objects from zones in correlation with the properties of the object.

Methodology & Theoretical Orientation: Objects with a wide variation of technological parameters (time, temperature, environment, pressure) were prepared; then the physical properties of the obtained objects and their sorting according to the above groups were studied in detail. Among the objects of each group, electrical conductivity, its anisotropy, thermal surface load, thermo electromotive force and impedance were studied. Then, for each object, a quantitative analysis of the image of the microstructure was carried out.

Findings: The parameters of the 2D zone, namely the ratio of its width to its height, form the prerequisites for the flow of chemical reactions, as a result of which different types of nanostuctures, which were named MXenes are formed. In zone 2, ordered double transition metal MXenes are formed, famous for their unique energy-saving and energy-generating properties. The use of the described methodology allowed us to conduct non-destructive quality control for sorting objects by zone. And also produce heating elements with a high thermal surface load (up to 300 W/cm²), thermocouples for high temperatures (up to 2500 °C) and aggressive environments.

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Biography

Vitaly Petrovsky has her expertise in evaluation and passion in improving ideas about the role of technological factors in the formation of the microstructure multicomponent functional composites based on oxygen-free compounds. He built his model after years of experience in research at their Institute, teaching at the Universities of Ukraine, Poland, France, Italy, China and administration in the USSR (1980-1685), in Germany (founder of Bach & Co GmbH 1994-1996), in Ukraine (Volyn Institute of Materials Science and Energy-saving from 2012). He first proposed the technology of ceramic composites with organized macrostructure, showed the advantages of their properties, previously explained the physical basis of such advantages and suggests that the reason for such features is the MXens formed in the technological cycle of consolidation. He, in fact, created a new methodology of: design-production-non-destructive quality control-application of advanced ceramics in power electronics.

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