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On The Issue Of Teaching Courses “Materials Science” And “Materials Science And Technology Of Structural Materials”

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Abstract In this article you can see role of the disciplines «Engineering materials» and «Materials and pro¬cesses in manufacturing» in the learning programmer of engineers. Materials, especially their properties and selection, are very important practical problem that is why it is necessary to learn diagnostic and analyze materials, computers model materials, the structure and destroying of materials.

Keywords: Materials, Pro¬Cesses, Manufacturing, Diagnostic, Engineer.

Introduction

Any scientific and technical system develops according to certain laws: knowledge is accumulated, then transformed into technologies that lead to new types of production, and science, in turn, receives new impulses. But due to the fact that different parts of the system develop at different speeds, natural “conflicts” arise, which are resolved by the transition of the system to a qualitatively new level. Most often, such a transition is accomplished through revolutionary means. As an example, we can cite the replacement of the classical model of the world, created in the time of I. Newton, with a quantum picture of the world, which arose largely thanks to the discoveries of E. Rutherford and N. Bohr. The result was a scientific and technological revolution, called the “Atomic Project”. From fundamental research we moved on to accelerators, from accelerators to the atomic bomb, from the atomic bomb to atomic reactors. As a result of this scientific revolution, new science, new energy, new types of weapons and, ultimately, a fundamentally new geopolitical face of the world appeared.

Let us recall the stages of human cognition of the environment. Even 300 years ago, in the eyes of scientists, nature was one and indivisible, the science of the surrounding world was called natural science, and the scientist who tried to study this world was called a natural scientist. Gradually, from this unknown whole, as the means of studying the world around us developed, man began to isolate segments available for analysis. In this way, various scientific disciplines were formed: mathematics, physics, chemistry, biology, geology, etc.

At the next stage, moving along the path of an increasingly in-depth analysis of the surrounding world, humanity created highly specialized areas in science and education, which determined, among other things, the sectoral principle of economic development.

At the first stage of development, all production consisted of industry technologies: wood processing, mining, metallurgy, etc.

At the second stage, more complex “inter-industry integrated” technologies appeared: microelectronics, aviation, astronautics, complex mechanical engineering. However, the sectoral nature of the economy remained.

In the middle of the last century, when it became possible to manipulate atoms and molecules, scientists began to construct new substances from them. Artificial materials were created that are well known to us today: semiconductor crystals of silicon, germanium, gallium arsenide, etc., dielectric crystals, in particular laser ones, and even materials that have properties that do not exist in natural substances .

The emergence of nanotechnologies, which form the basis of a new scientific and technological revolution, will radically change the world around us, our lives. But, unlike information technologies, the nanosphere is material. Nanotechnologies are a basic priority for all existing industries, which will also change information technologies themselves. This is the synergy of the new system.

Main part. Materials science is the science of the nature, properties and behavior of materials based on metals, non-metallic elements of oxide systems, non-oxide metal-like and non-metallic compounds, as well as the laws of the processes of their production, structure formation, connection and destruction.

Materials science is a science that establishes the principles of “designing” and creating new materials, developing their technologies and establishing areas of application.

Thus, modern materials science is a huge body of knowledge that requires an understanding of new sections of fundamental sciences, as well as the processes of structure formation and destruction of materials, problems of analysis and diagnostics of materials, computer modeling methods in materials science, etc.

Modern science has accepted the idea of a hierarchy of structural levels of materials, which can be considered as a special case of the hierarchy of structural levels of matter as a whole, described by the concept of “quantum ladder in the structure of matter” (W. Weischopf). The quantum ladder is a sequence of structural states of matter, realized through a gradual increase (or decrease) of the transferred energy.

In materials science, the bottom part of the quantum ladder is most important. The variety of structural states in condensed matter (liquid, amorphous, nanocrystalline, polycrystalline, single-crystalline) makes it possible to flexibly and comprehensively control the physical-mechanical, thermal and electrophysical, magnetic, physicochemical and other properties of materials using external relatively low-energy influences .

Since real materials are multicomponent and multiphase systems and also have a developed or active surface, students of a technical university should have an understanding of topochemical reactions, heterogeneous catalysis and the surface of materials as a source of defects and their nonequilibrium, as well as aspects of electrochemistry as the basis for understanding the processes of corrosion of materials, electrolysis of solutions and melts and the creation of solid electrolytes. The engineering materials science formula is usually presented as "composition - structure - properties".

The structural features of materials largely determine the complex of their various properties, methods and methods for determining which are very important for the practical training of students. Modern equipment for determining the mechanical, electrical, thermophysical and other properties of materials is being improved very quickly, so any technical university should have such laboratories.

It is very important for an engineer in the modern world to use computer technology in the certification and diagnostics of materials and, above all, in the processing and visualization of the results of flaw detection and introscopy, which allows reliably identifying and localizing defects of various origins in materials. The opposite of structure formation, the phenomena of destruction of materials are realized under the influence of external electric fields. As a result of energy accumulation, gradual degradation of the structure and complete destruction of the material take place, and the products of destruction move to a higher level of the quantum ladder. From this perspective, any mechanical engineer must clearly understand three types of destruction: mechanical, chemical and thermal.

Methods

In recent years, new methods for the synthesis of substances and chemical compounds have been developed. There has been a breakthrough in the field of theory and technology of composite and nanostructured materials. Computer methods have been developed for modeling the structures of materials and the processes of their formation and destruction. Methods and instruments have been created that make it possible to study the structure of materials at the level of atomic resolution, as well as analyze their elemental, isotopic and phase compositions with greater accuracy. In turn, the presence of a modern analytical base has led to the production of ultra-pure, defect-free single crystals and polycrystalline materials used in semiconductor technology and nuclear energy. Methods and equipment are already being used for precision determination of various physical properties of materials in a wide range of external influence parameters.

Results and Discussion

Finally, as a result of the use of complex theoretical and applied research, industrial technological processes for the production of products from new materials have been developed, new areas of their application have been expanded and found, both in traditional and advanced branches of technology.

The educational process is always two-sided, on the one hand the teaching staff, on the other - the audience, in our case the students. Only the symbiosis of these two sides of one process ensures a good result.

The student audience is supplied to us by the secondary school, and we cannot do anything here. In this case, lawyers say de facto, they are forced to work with whoever is there. One thing can be stated: the level of training of secondary school graduates is declining. There are as many examples as you like.

The question is, what can we do in this situation? Whether we like it or not, when studying general education disciplines it is necessary to start by repeating basic definitions in subjects such as mathematics, physics, chemistry, perhaps by reducing the time for studying more complex sections.

When the audience finds it difficult to determine the areas and volumes of the simplest geometric figures, confuses the determination of current and voltage, oxidation and reduction reactions, it is problematic to study more complex material and count on successfully mastering engineering disciplines.

First of all, this is working with curriculum. Everyone agrees that disciplines should be studied in a certain sequence. Let's take the Department of Materials Science and Metal Technology. First year, first semester: the course "Technology of Structural Materials" (TCM) is taught, which is based on mathematics, physics, chemistry, and drawing. All these subjects are studied simultaneously or later. What kind of basing are we talking about? Moreover, materials science and technology of structural materials is a general engineering discipline, which is the basis for the study of special courses. And these are, as a rule, III-V courses. Who benefits from this gap? Moreover, the complex discipline "Materials Science and Technology of Structural Materials," as the name suggests, consists of two parts. According to the curriculum, the TCM course is taught first, and then "Materials Science". TCM is an applied discipline based on a scientific basis - materials science. If a person has learned to do something, why does he need a stream of some instructions and instructions? A paradoxical situation - when studying TCM we operate with concepts, terms: hardness, alloys, diagrams, heat treatment, chemical-thermal treatment, and all this will be studied later.

Conclusion

Everything is too obvious to provide any further argumentation. Thus, the disciplines "Materials Science" and "Materials Science and Technology of Structural Materials" are the most important components in the general engineering training of specialists in various fields.

References

[1] Mamatov, F., Mirzaev, B., Mirzahodzhaev, S., Uzakov, Z., & Choriyeva, D. (2021). Development of a front plow with active and passive working bodies. In IOP Conference Series: Materials Science and Engineering (Vol. 1030, No. 1, p. 012164). IOP Publishing.

[2] Mirzakhodjaev, S., Shodiev, K., Uralov, G., Badalov, S., & Choriyeva, D. (2021). Efficiency of the use of the active working body on the front plow. In E3S Web of Conferences (Vol. 264, p. 04047). EDP Sciences.

[3] Mamatov, F., Ergashev, I., Mirzaev, B., Pardaev, X., & Chorieva, D. (2021, February). Research of the Penetration Process of the Frontal Plow. In Journal of Physics: Conference Series (Vol. 1779, No. 1, p. 012002). IOP Publishing.

[4] Aldoshin, N., Kurbanov, S., Abdullaev, A., Khujayev, A., & Choriyeva, D. (2021). Parameters of the angle-lift of the front plow for smooth, rowless plowing. In E3S web of conferences (Vol. 264, p. 04042). EDP Sciences.

[5] Badalov S., Choriyeva D., Raxmatov D. PLUG FOR EVEN PLOWING WITHOUT A FURROW //Science and Innovation. – 2022. – Т. 1. – №. 8. – С. 638-640.

[6] Маматов, Ф. М., Темиров, И. Ғ., Очилов, С. У., & Чориева, Д. (2021). ВЛИЯНИЕ РЕЛЬЕФА ХЛОПКОВОГО ПОЛЯ НА РАВНОМЕРНОСТЬ ХОДА ДВУХЪЯРУСНОГО

ПЛУГА. Инновацион технологиялар, (Спецвыпуск 1), 137-140.
[7] Маматов Ф. М., Чориева Д. Н., Равшанова Н. Б. УСОВЕРШЕНСТВОВАННЫЙ ПЛУГ К КОЛЕСНЫМ ТРАКТОРАМ //Инновацион технологиялар. – 2021. – №. Спецвыпуск 2. – С. 64-67.
[8] Маматов Ф. М. и др. ПЛУГ С ПОЧВОУГЛУБИТЕЛЯМИ ТИПА «ПАРАПЛАУ» //Инновацион технологиялар. – 2021. – №. Спецвыпуск 1. – С. 121-124.
[9] Kurbanov S. et al. Parameters of the angle-lift of the front plow for smooth, rowless plowing //E3S Web of Conferences. – 2021.
[10] Maiviatov, F. M., Shomirzaev, M. K., Chorieva, D. N., Rashidov, N. S., & Ochilov, S. U. (2023). Linear plow with disk angle. In E3S Web of Conferences (Vol. 401, p. 04026). EDP Sciences.
[11] Choriyeva D. DESCRIPTION, DIDACTIC REQUIREMENTS AND CONDITIONS OF SUBJECTS THAT DEVELOP STUDENTS'CREATIVE ABILITIES RELATED TO GENERAL PROFESSIONAL SUBJECTS //Science and innovation. – 2022. – Т. 1. – №. B6. – С. 296-298.
[12] Serabovich, Tursunov Shavkat. "Analysis of existing desings of crushers for crushing municipal solid waste." International Journal for Innovative Engineering and Management Research (IJIEMR)//https://scopedatabase. com/documents/00000181/00000-84600. Pdf (2021).
[13] Serabovich T. S. et al. Basic Energy Assumptions For Solid Waste Disposal //Galaxy International Interdisciplinary Research Journal. – 2022. – Т. 10. – №. 1. – С. 185-188.
[14] Serabovich T. S. Mechanisms For Determining The Parameters Of The Grinder //Texas Journal of Multidisciplinary Studies. – 2022. – Т. 5. – С. 321-323.
[15] Shavkat T. Based On The Parameters Of The Gear Grinder In Domestic Solid Waste //Horizon: Journal of Humanity and Artificial Intelligence. – 2023. – Т. 2. – №. 5. – С. 564-568.
[16] Shavkat T. Criteria for Evaluating the Efficiency of Domestic Solid Waste Grinding Machines //Web of Synergy: International Interdisciplinary Research Journal. – 2023. – Т. 2. – №. 5. – С. 323-329.
[17] Турсунов Ш. С. Состояние Вопроса Обезвоживания Автотракторных Масел //Новости образования: исследование в XXI веке. – 2022. – Т. 1. – №. 3. – С. 43-45.
[18] Турсунов Ш. С. Материалы Для Машин И Механизмов Теплоэнергетики //Новости образования: исследование в XXI веке. – 2022. – Т. 1. – №. 3. – С. 46-48.
[19] Муртазаев Э. М., Турсунов Ш. С. Подготовка конкурентоспособных специалистов в системе профессионального образования. – 2021