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# ACHIEVING THE IDEAL END RESULT WHEN USING ACTIVATED CARBON-CARBON FABRICS (Achieving the ideal end result in medicine through the use of activated carbon-carbon fabrics and their innovative modifications in modern treatment processes and medical equipment, including integrative versions)

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**Abstract**

The article examines approaches to achieving the ideal final result in medicine through the use of innovative materials, particularly activated carbon-carbon fabrics and their advanced modifications, as well as modern computer modeling, artificial intelligence, and artificial neural networks. It is shown that the effective implementation of innovations requires the harmonious integration of new materials and technologies with established medical solutions, ensuring continuity, safety, and stability of treatment processes. Special attention is given to the principles of systemic and combinatorial design presented in the scientific and technological works of Gulmira Kenzhebayeva, which focus on the adaptation of innovative materials within existing healthcare infrastructures.

**Keywords:** *Ideal final result; Activated carbon–carbon fabrics; Achieving the ideal final result in medicine; Activated carbon–carbon fabrics and their innovative modifications in modern treatment processes and medical equipment, including integrative versions of smart family physician office equipment*

The article presents examples involving natural and composite materials, including zeolites and carbon-carbon composites, for the development of new medical devices, instruments, and auxiliary equipment with improved performance characteristics. Emphasis is placed on the role of computer modeling and digital design in optimizing material properties, enhancing treatment effectiveness, and supporting the development of next-generation medical technologies.

The field of innovation is typically saturated with traditionally used technical solutions and materials; therefore, innovative changes of all types must be adapted to and integrated with existing technologies and materials as a condition of successful implementation.

**Figure 1.**

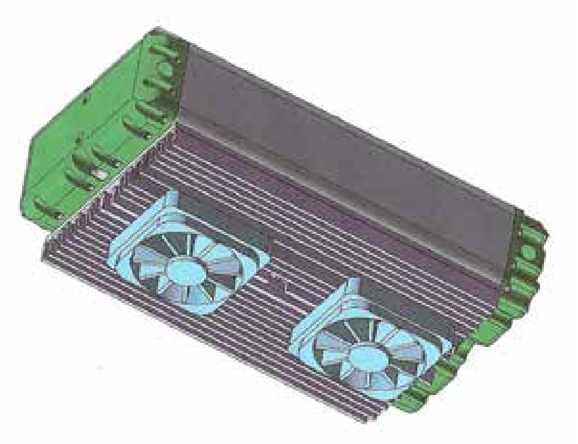
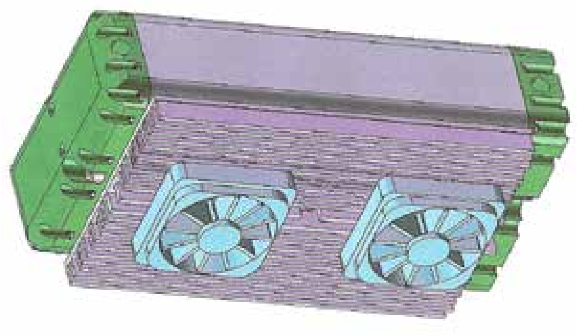
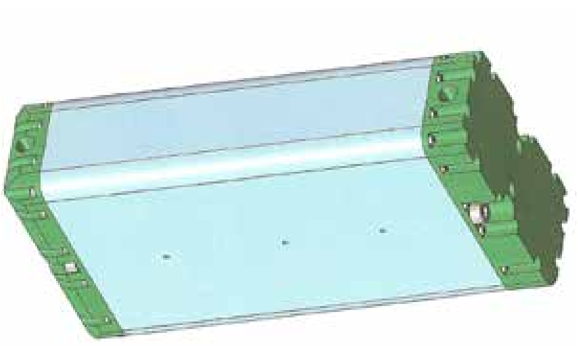


**Figure 2.**



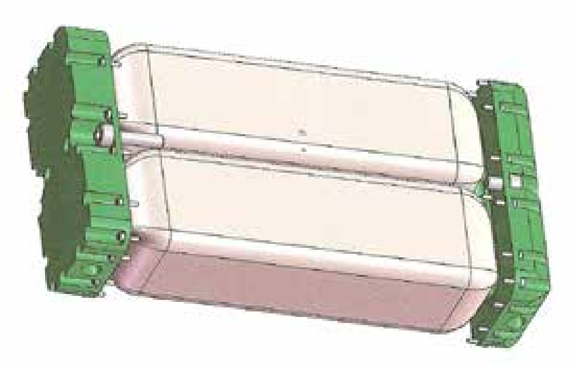
In infrastructure and foundational solutions, including those serving auxiliary functions, the correct, coordinated, and harmonious integration of system elements is of critical importance.

**Figure 3.**



System interactions at all levels largely determine the success of the innovation process in conjunction with the overall infrastructure and the design architecture of equipment and specialized instruments.

**Figure 4.**

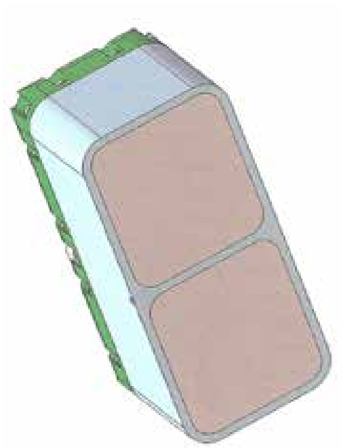


Overall, innovation is not an end in itself. The central objective of the entire innovation process is to achieve a final outcome from the implementation of innovative ideas at a level that enables a qualitative improvement of all treatment process parameters while preserving the continuity of equipment, technologies, materials, and consumables.

In this publication, the author intends to examine several practical relationships among these elements and analyze the fundamental methods and approaches for adapting innovative solutions and materials within the structure and interdependencies of traditionally used technologies, techniques, and materials.

Until recently, the innovation process was largely driven by specialists in medical technologies and materials who often lacked sufficient experience in computer modeling and process simulation. As a result, implementation decisions were primarily based on positive testing and research outcomes.

**Figure 5.**



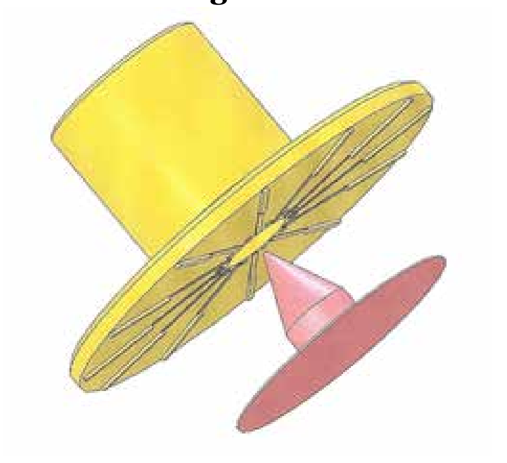
For a considerable period, dialogue between conservative-minded specialists and innovators was often lengthy and not always successful, frequently to the disadvantage of the innovators. Practitioners remained in search of solutions that could clearly demonstrate practical and effective pathways for implementing innovations without causing significant disruption to the stability of established technological processes.

To the credit of advocates of innovative technological transformation, it should be noted that in recent years several comprehensive solutions have emerged that enable the seamless implementation of innovative technologies under the real conditions of modern medical science and practice, as well as in other scientific and applied fields.

*The author of this publication finds that, within her methodology and analytical approach, Gulmira Kenzhebayeva considers comprehensive integrative solutions to be the most effective approach, as reflected in the proposals presented in her scientific and technological publications and books.*

*What particularly distinguishes these proposals and developments from similar works by other authors is the broad platform they provide for experimental computer modeling. This capability is based on Gulmira Kenzhebayeva's extensive and multidisciplinary knowledge of the fundamental principles and methods of systems-based and combinatorial computer modeling applied to related innovation processes, including those at the intersection of key scientific and technological disciplines.*

**Figure 6.**

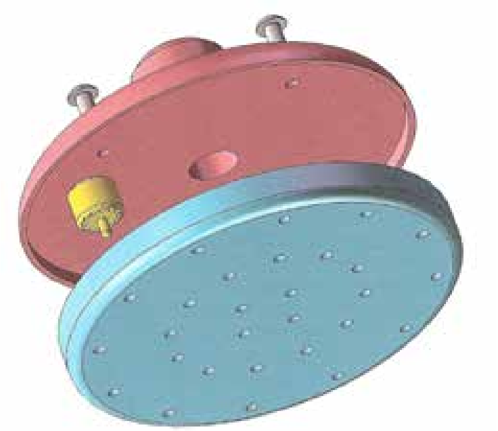


*In analyzing the 11 innovative medical technologies presented in her publications, Gulmira Kenzhebayeva advances a thesis of particular importance for addressing this challenge – the combinatorial structure of each solution. This concept is based on the harmonious integration and mutual complementarity of traditional technologies and materials with innovative technologies and materials, primarily composite materials.*

*Among Gulmira Kenzhebayeva's proposals, the most significant aspect is the emphasis on the integration and comprehensive adaptation of new materials and technological approaches within the environment of existing, proven technologies and materials. This approach creates a foundation for transforming their properties and capabilities to a new, innovative level.*

The adoption of these principles has made it possible to take into account the potential for the further development of materials, designs, and technological methods, enabling a smooth transition, for example, from flexible, permeable, and volumetrically porous systems and materials to solid materials that retain similar chemical compositions and fundamental properties.

**Figure 7.**

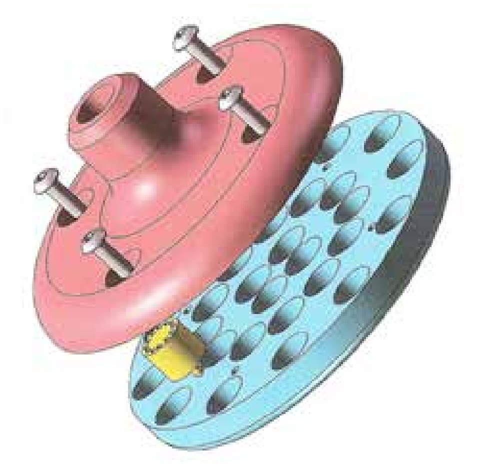


Furthermore, this fundamental approach to the application of new composite materials in novel medical applications with unique properties and characteristics makes it possible to develop new medical devices and instruments that meet the demanding requirements of modern healthcare technologies.

*It is also important to recognize that, in addition to advanced composite materials, nature provides exceptionally valuable natural materials. The approaches outlined in Gulmira Kenzhebayeva's publications make* *it possible to create a harmonious combination of well-known natural materials and extensively validated engineering and technological methods.*

The image presented at the beginning of this publication illustrates such an application through the use of the natural aluminosilicate mineral zeolite in the laboratory preparation of water, for example, for cleansing the surface of a patient's body prior to subsequent medical treatment procedures.

**Figure 8.**



*The presented models demonstrate that, by applying the general principles of innovative design proposed by Gulmira Kenzhebayeva, it is possible to achieve an almost ideal final result within a traditional form and structure – such as an ion-exchange filter – through the use of natural and completely safe materials. Such solutions can provide unique characteristics and performance advantages, including:*

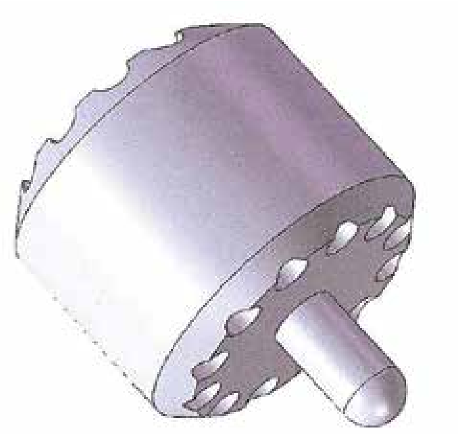
– The complete elimination of chemical reagents from the process.

– The utilization of the natural ion-exchange properties of zeolite.

– The exceptionally high ion-exchange capacity of zeolite, including its potential for the purification of radioactively contaminated liquids.

These design approaches fundamentally transform the requirements placed on the design process itself, creating opportunities for the extensive integration of computer modeling methods and simulation techniques into the development and optimization of innovative solutions.

**Figure 9.**



*The conceptual solutions proposed by Gulmira Kenzhebayeva make it possible to further develop carbon-carbon composites, for example by transforming carbon-carbon fabrics into compressed solid components with unique properties that open new opportunities for innovation in medical and related applications.*

One of the key advantages of these materials is their exceptionally high temperature resistance, with the potential to operate at temperatures of up to 4000 °C. Disinfection at such temperatures makes it possible to reliably eliminate bacteria, viral agents, and other forms of contamination from medical instruments and equipment.

**Figure 10.**

The following design models feature massage heads in which all components, including the massage plungers, are manufactured from compressed carbon-carbon fabric composites. This design approach is characterized by the ability to combine the novel properties and performance characteristics of advanced materials with traditional materials and established methods of application within a unified systems-design framework.

*The fundamental possibility of developing technical solutions of this kind emerged through the application of the principles of combinatorial design and software-driven selective modeling of innovative materials, their integrative combinations, and modifications, as outlined in the publications of Gulmira Kenzhebayeva. These principles were incorporated throughout all stages of the project development process.*

As an example, the author presents a design concept based on Bernoulli principles and effects for localized vortex cleaning systems intended for the preparation of a patient's body surface prior to medical intervention. The components of the proposed device are manufactured from the same compressed carbon-carbon composite material discussed above, enabling highly effective cleaning and disinfection of contact elements.

Although only a limited number of examples are presented, they clearly demonstrate the validity of these design approaches and the principles of material selection, providing a foundation for the further modification, optimization, and enhancement of material properties and functional capabilities.

**Figure 11.**

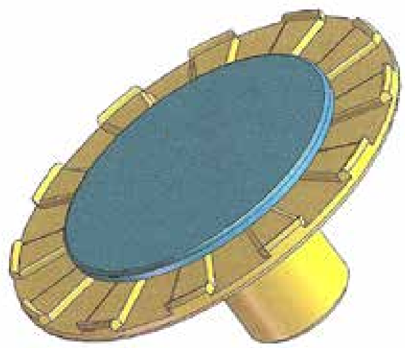
As demonstrated by design practice, for devices and systems that can be classified as auxiliary medical equipment, accessories, and instruments, it is most effective to utilize modern versions of the SolidWorks engineering design software suite during the development process.

The software already incorporates capabilities for structural analysis of design quality and performance. The accumulated data and integrated parameters can be effectively applied in parallel computer modeling processes to evaluate and verify the validity of proposed design solutions.

Furthermore, when all necessary technical requirements, specifications, and local standards are available, specific critical requirements and control parameters embedded within SolidWorks make it possible to utilize the software's internal analytical capabilities for more detailed computer modeling during the so-called late design stages.

When every component of a design serves not merely a decorative function but plays a critical role in ensuring the proper operation of a device, instrument, or piece of equipment, SolidWorks enables detailed local modeling of individual components as well as assemblies consisting of multiple functionally interconnected parts.

**Figure 12.**



Another factor that significantly facilitates both the setup and selective processes of computer modeling is the use of engineering design software rather than purely graphical programs during the design stage.

The author intends to devote future publications to a more detailed discussion of this topic.

## References, Patent and Licensing Materials

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