

Although the obtained membranes demonstrate high efficiency in reducing the colour of aqueous solutions, which makes them promising for use in water treatment and wastewater treatment, however they are characterized by low productivity.

The purpose of the work is to develop a method of obtaining membranes from modified cellulose fiber with improved productivity.

The goal was achieved due to the introduction of an additional reinforcing component in the form of a synthetic fiber with different flow rate into the membrane composition. Polyethylene terephthalate fiber was used as a synthetic filler, which was previously crushed to a particle size of about 3 mm for uniform distribution in the membrane structure. The introduction of synthetic fiber made it possible to improve the structural integrity of the membranes, reduce their tendency to deformation during operation, and also contributed to the formation of a porous structure, which provides better filtering capacity.

The consumption of polyethylene terephthalate fiber in the composition varied from 3% to 15% of the total mass of the membranes. This ensured an increase in the permeability of the membranes without a significant loss of selectivity.

The obtained results show that the approach, which consists in the combination of natural and synthetic fibers, is fully justified to ensure the production of membranes with the necessary structural and filtering characteristics.

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INTEGRATION OF ARTIFICIAL INTELLIGENCE INTO ENVIRONMENTAL MONITORING SYSTEMS: CURRENT STATE AND PROSPECTS

ANDRII NOSOV, PhD student

MYKHAILO V. KORZHYK, Associate Professor, PhD in Chemical Engineering,
Scientific Adviser

SVITLANA M. MOISEIENKO, Associate Professor, PhD in Philology, Language
Adviser

*National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic
Institute»*

The rapid development of artificial intelligence (AI) technologies and sensor systems creates unprecedented opportunities for environmental monitoring, providing previously unattainable levels of accuracy, efficiency, and scalability

[1]. Traditional monitoring methods face limitations due to high equipment costs, personnel requirements, and data processing complexity. This paper examines recent advances in AI integration into environmental monitoring systems and outlines promising future directions.

Modern AI-based environmental monitoring systems comprise three key components: distributed sensor networks, machine learning algorithms, and visualization platforms [2]. Recent technological advances have significantly enhanced these components through sensor miniaturization, deep learning algorithm development, and cloud-based visualization tools that make results accessible to researchers, government organizations, and the public.

Four main categories of AI applications in environmental monitoring have emerged. Air quality monitoring systems utilize neural networks to process data from miniature urban sensors, employing AI-based calibration to achieve professional-grade accuracy with inexpensive equipment [3]. The PurpleAir network exemplifies this approach, using machine learning to adjust for environmental factors and providing spatial resolution unattainable with traditional systems.

Water resource monitoring combines physical sensors with computer vision to detect pollution, algal blooms, and other aquatic threats [1]. Autonomous floating platforms equipped with multispectral cameras and biosensors can identify contamination days before it becomes visible through conventional methods, enabling preventive action [4].

Biodiversity monitoring employs machine learning for automated species identification using camera traps, acoustic sensors, and satellite imagery [2].

Climate change monitoring integrates diverse data sources into comprehensive models, with algorithms revealing hidden relationships between climate variables [5]. Generative adversarial networks (GANs) show particular promise in filling historical data gaps and creating detailed regional climate scenarios to support adaptation strategies.

Despite progress, AI integration faces significant challenges: ensuring data reliability with limited training samples, optimizing energy efficiency for remote deployment, and improving result interpretability for decision-makers [5, 7]. Innovative approaches addressing these challenges include transfer learning techniques, energy-efficient neuromorphic computing, and explainable AI methods like LIME and SHAP that make complex models comprehensible to non-specialists.

Future development directions include blockchain integration for data integrity [6], federated learning for privacy preservation [8], and self-organizing sensor networks that adapt to changing conditions. Edge computing shows particular promise, enabling on-device data processing that reduces communication bandwidth requirements [4].

Socio-economic analysis reveals that AI-based monitoring systems can significantly reduce environmental protection costs while improving effectiveness [1]. Early detection prevents significant economic damage and democratizes environmental information through citizen science initiatives [6].

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ARCHITECT AS THE BRIDGE BETWEEN THE PHYSICAL AND VIRTUAL WORLD

DARIA ODAINYK, student

ALLA M. KROKHMAL, Associate Professor, PhD in Pedagogy, Scientific Adviser

O. M. Beketov National University of Urban Economy in Kharkiv

For centuries, architects have been leading the construction of physical worlds. Now, modern community is witnessing a major shift from the real economy to the digital one, and the integration of these two has been accelerated drastically since the global pandemic. And one of the clearest examples of this trend is the development of the metaverse, in particular its use in architecture.

It is known architects have already faced the identity crisis in the physical world. They used to be the master builders, having all the knowledge and techniques of construction. However, in the modern industrial society, many majors like design composition, mechanics, electricity, budgeting, construction management have been separated from architecture discipline. The remaining part is mostly form-making, visualization, collaboration, and so on. Architects act as project managers to work with other consultants, engineers, contractors, clients, government officials to make a project happen.

Unfortunately, architects are lack core technology that is advancing, and tech “outsiders” are aiming to refactor or revolutionize the AEC (Architecture, Engineering and Construction) industry. Metaverse is a new playground that architects could take part in together with other stakeholders. Instead of providing one-to-one services, architects could reinvent the business model to provide