

**POLYURETHANE AND 18-MOLYBDODIPHOSPHATE  
POLYMERIC COMPOSITE MATERIAL FOR NATURAL  
AND INDUSTRIAL WATER TREATMENT**

**<sup>1</sup>Petrushyna H.O., <sup>2</sup>Maksymova N.M., <sup>3</sup>Bazel Ya.R., <sup>4</sup>Vishnikin A.B.**

*<sup>1</sup>Dnipro State Agrarian and Economic University*

*Serhiy Yefremov St., 25, 49600, Dnipro*

*<sup>2</sup> LLC «Technical University «Metinvest Polytechnic»»*

*Pivdenne shosse, 80, 69008, Zaporizhzhia*

*<sup>3</sup>Pavol Josef Šafárik University in Košice*

*Možesová Street 11, Košice, Slovak Republic*

*<sup>4</sup>Oles Honchar Dnipro National University*

*Nauky Avenue, 72, 49045, Dnipro*

*petrushyna.h.o@dsau.dp.ua*

The development of modern water treatment equipment requires the creation of durable coatings that ensure the stability of devices during their long-term operation. The polymers must be chemically inert in relation to other substances of the polymer composite material (PCM), have high electrical conductivity and sufficient stability. Among the polymers of interest are polyurethanes (PU) – polymers of the general formula:  $[-(\text{NH})-(\text{R}')-(\text{NH})-(\text{COO})-(\text{R}'')-(\text{COO})-]_n-$ . Due to the diversity of the chemical structure of their polymer chains and specific structure, good performance properties of the resulting materials can be expected. Their physical-mechanical and physicochemical properties depend on the structure and microphase distribution between hard and soft blocks. By varying the proportions of diols, polyols and diisocyanates in the synthesis of segmented film-forming polyurethanes with their subsequent modification, a polymeric material for a specific application can be obtained [1].

Wells-Dawson Polyoxometalates (WD POMs) are promising redox reagents [2]. They can accept and give up electrons under the influence of an external potential, visible or UV radiation. The modification of the WD POMs structure and the control

of electronic properties by changing the acidity gave these compounds such characteristics as stability in solution and solid state, and demonstrated the potential for their use in the development of new molecular magnetic devices.

The possibility of using a polymeric composite material consisting of polyurethane and 18-molybdodiphosphate, as an active substance, for further use as a durable stable coating for water treatment system devices was considered. The molybdenum Wells-Dawson polyoxometalate 18-molybdodiphosphate anion  $P_2Mo_{18}O_{62}^{6-}$  is a fairly strong oxidant. The interaction of 18-molybdodiphosphate with different reducing agents occurs at different acidity levels. By varying the pH of the solution, several substances can be determined in the presence of each other. The tetrabutylammonium salt of 18-molybdodiphosphate was used to create polymeric composite material. The nature of the interaction between polyurethane and 18-molybdodiphosphate was investigated by IR spectroscopy. In the region of 1080-510  $cm^{-1}$ , the spectrum of the polyurethane film with 18-molybdodiphosphate retains the vibration bands of 18-molybdodiphosphate atoms. This confirms the absence of chemical interaction between the polymer and the heteropoly anions and the formation of a mechanical mixture of the two substances. The polymeric composite material with a mass content of 18-molybdodiphosphate of 30% is optimal. The synthesized polymeric composite material from polyurethane and 18-molybdodiphosphate is reusable due to its high reducing properties, which was verified by experimental contact of polymeric composite material with a 0.1 M hydroquinone solution.

#### References:

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2. Nowicka, D., Vadra, N., Wieczorek-Szweda, E., Patroniak, V., Gorczynski A. (2024). Overview of Wells-Dawson Polyoxometalates: from structure and functionalization to application. *Coordination Chemistry Reviews*, 519, 216091. <https://doi.org/10.1016/j.ccr.2024.216091>.