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# XV МІЖНАРОДНА КОНФЕРЕНЦІЯ З ФІЗИКИ І ТЕХНОЛОГІЇ ТОНКИХ ПЛІВОК ТА НАНОСИСТЕМ

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## Program

# XV INTERNATIONAL CONFERENCE ON PHYSICS AND TECHNOLOGY OF THIN FILMS AND NANOSYSTEMS

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE**
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## Effect of Filler Nature on Chemical Resistance and Microhardness of Epoxy Composite Films

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Introduction of fillers to the polymer composites including epoxy ones, not only considerably improves technological properties of polymers, but also substantially influences on water and chemical resistance, and also on microhardness and other characteristics of composite films on their basis.

We investigated water absorption processes, chemical stability and microhardness of investigated samples, which contained as a polymeric matrix epoxy resin (UP-655) and mineral fillers: graphite, mica, aluminum oxide, and polymer filler - polyaniline (PANI) at their content (0-30% mass).

Film samples of composites in size 30×15 mm were hardened with 100°C for 2 hours and maintained within 30 days in the water vapor atmosphere of hydrochloric and acetic acid.

Introduction of mineral fillers, specifically polymer ones significantly affects on all complex of operating films. The most water and acid absorption processes took place for 24 hours exposure of films in acid solution. The higher effect on water absorption processes and chemical resistance to the acid action is caused by mica, which is connected with high concentration of hydroxyl groups -OH on the filler surface. Increasing of filler content reduces the amount of water absorption and deceleration of this process.

Researching physical and mechanical properties of filled epoxy composites it was found that introduction of mineral filler substantially influences on their microhardness. Thus the character of this influence largely depends on the type of filler and its content. At presence of fillers in matrix of epoxy resin the change of maximum value of conical point of fluidity ($F_\infty$) or microhardness takes place with large content of filler (>20% mass) in an epoxy matrix is the decrease of microhardness and at 25-30% mass in the filler's content the integrity of the sample is violated. Thus the most influence on the microhardness changing is caused by aluminum oxide $Al_2O_3$. Introduction of mica leads to a decrease of microhardness in comparison with $Al_2O_3$, probably, by the reduction of the concentration of the reacting substances in the unit's volume. A slight increase of microhardness in case of filling with graphite is determined, probably, by a low concentration of hydroxyl groups -OH that absorbed graphite's surface prevailing over carboxyl COOH- groups, which are sedentary at the catalysis of reactions.