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DEVELOPMENT OF STIMULI-RESPONSIVE COATINGS FOR CELL-CELL COMMUNICATION STUDY

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Introduction. Understanding cell-cell communication mechanisms can provide insights into how cells coordinate their activities, regulate gene expression, and respond to external stimuli. While it is recognized that cells are influenced by various stimuli that can impact their behavior, there is still much to learn about the interaction between cells and their changing microenvironment. Stimuli-responsive materials offer the ability to introduce dynamic mechanical and physical changes in the cellular microenvironment, allowing researchers to study the effects of these changes on cell behavior and response [1]. In this regard, the aim of our study is to develop non-toxic, biocompatible coatings that are responsive to pH change or electromagnetic irradiation and releasing the ions (Na^+, K^+, Ca^{2+} *etc.*) providing cellular communication. Use of SVET technique give us the possibility to study electrochemical processes and measure local current densities [2].

Main part. Titanium dioxide films were obtained by hydrolysis of 1 wt. % solution of titanium (IV) butoxide (TBT). The coatings were applied to different substrates: glass and titanium plates. The final coatings consisted of 5 layers of TiO_2 and 1 layer of 4-(4-nitrophenylazo)phenol thiacalix[4]arene. The local ionic currents in solution over the surface under UV-irradiation were mapped using SVET technique. It has been found that the current density has increased compared to its performance prior to UV exposure.

Conclusions. The multi-layered coatings were obtained. The performance of the TiO_2, combined with films of 4-(4-nitrophenylazo)phenol thiacalix[4]arene loaded with Ca^{2+} , were studied using SVET techniques.

References:

1. Kruk T. et al. Stimuli-responsive polyelectrolyte multilayer films and microcapsules // Adv Colloid Interface Sci. Elsevier, 2022. Vol. 310. P. 102773.
2. Bastos A.C., Ferreira M.G.S. Application of the scanning vibrating electrode technique to the characterization of modern coatings // Handbook of Modern Coating Technologies: Advanced Characterization Methods. Elsevier, 2021. P. 1–43.