Ukrainian Conference
with International Participation

CHEMISTRY, PHYSICS AND TECHNOLOGY OF SURFACE

dedicated to the 95th birthday of
Academician Oleksii Chuiko

28-29 May 2025
Kyiv
Ukraine

Chuiko Institute of Surface Chemistry
of National Academy of Sciences of Ukraine
Scientific Council
"Chemistry and Technology of Surface Modification"
Interbranch Scientific and Technical Complex "Surface Chemistry"
of National Academy of Sciences of Ukraine

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Book of abstracts

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Тези доповідей Всеукраїнської конференції з міжнародною участю “Хімія, фізика і технологія поверхні”, присвяченій 95-річчю від дня народження академіка НАН України О.О. Чуйка – Київ, 2025. – 246 с.

Book of abstracts of Ukrainian Conference with International Participation “Chemistry, Physics and Technology of Surface” dedicated to the 95th birthday of Oleksii Chuiko, Academician of NAS of Ukraine – Kyiv, 2025. – 246 p.

Збірник містить тези доповідей, які було представлено на конференції. Тематика конференції: теорія хімічної будови та реакційна здатність поверхні твердих тіл; фізико-хімія поверхневих та міжфазних явищ; хімія, фізика та технологія наноматеріалів; медико-біологічні та біохімічні аспекти вивчення наноматеріалів. Тези доповідей подано в авторській редакції.

The Book contains abstracts of the Conference presentations. The Conference topics: theory of chemical structure and reactivity of solid surfaces; physical chemistry of surface and interfacial phenomena; chemistry, physics and technology of nanomaterials; medical, biological and biochemical aspects of investigation of nanomaterials. The abstracts are published in the author's edition.

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Printing of the Book was approved by the decision of the Scientific Council of Chuiko Institute of Surface Chemistry of National Academy of Sciences of Ukraine (Minutes of the meeting No. 7 of May 12, 2025).

Experimental justification of the use of nanocomposite surgical suture material with antimicrobial properties for the prevention of postoperative purulent-inflammatory complication

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We have developed a new type of surgical suture material made of polypropylene (PP) modified with carbon nanotubes (CNTs) and silver nanoparticles (Ag/SiO_2).

In an experiment on rabbits, conducted in three series, a model of an infected wound was created in compliance with bioethical standards. After 24 h, the wound was washed with an antiseptic and sutured using different materials: in the first series with nylon; in the second with polypropylene threads; and in the third with the developed suture material. After surgery, the wound condition was monitored, and on the seventh postoperative day, a biopsy was performed to assess changes in the sutured tissues.

In the 1st series, all animals exhibited skin hyperemia, edema, and massive tissue infiltration in the wound area, with wound suppuration occurring in four rabbits. In the 2nd series, pronounced tissue infiltration and skin hyperemia were also observed, and three cases of wound suppuration were recorded. Histological examination revealed that in the first and second series, microabscesses were present in the tissues, and microorganisms were detected in the puncture channels around the ligatures. There was marked polymorphonuclear cell infiltration and an accumulation of neutrophilic leukocytes (NL). Proliferative processes in the sutured tissues were weakly expressed, as indicated by the limited presence of young granulation tissue, fibrin, fibroblasts, macrophages, and NL.

When using the developed suture material (third series), inflammatory infiltration in the postoperative wound area had resolved by the seventh day. Histological analysis showed minimal NL infiltration. A large amount of granulation tissue and fibroblasts, as well as the presence of collagen fibers, was observed between the sutured tissues - indicating active reparative regeneration and scar formation.

The use of the developed suture material in infected wound models prevented suppuration and promoted favorable conditions for reparative regeneration, demonstrating its promising potential for clinical application.

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Center for collective use of scientific instruments / equipment "Mass spectrometric complex with laser desorption/ionization MALDI-TOF Autoflex II LRF20", established at the Chuiko Institute of Surface Chemistry of NAS of Ukraine in 2005, welcomes interested persons for cooperation.

Center equipment:

HPLC Agilent 1260 Infinity II
(Agilent Technologies, Germany, 2020) - high performance liquid chromatograph for the analysis of mostly polar non-volatile compounds.

Mass spectrometer Autoflex II LRF20 (Bruker Daltonik GmbH, Germany, 2004) - time-of-flight mass spectrometer with matrix-assisted laser desorption/ionization (MALDI-TOF / TOF) for analysis of ions in a wide range of m/z (up to 100 kDa).

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