NeXT-Chem

INNOVATIVE CROSS-SECTORAL TECHNOLOGIES

Exploratory Workshops Series

VIth EDITION, 21-22 MARCH 2024

ICECHIM

Associated events

Bucharest, ROMANIA

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Book of Abstracts comprising
scientific contributions presented at

Exploratory Workshop NeXT-Chem: "Innovative Cross-Sectoral Technologies"

National Institute for Research & Development in Chemisty and Petrochemistry - ICECHIM Bucharest

March 21-22, 2024

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Romanian Chemical Society

Societatea de Chimie din ROMANIA

A long-time partner of the scientific events organized by the National Institute for Research & Development in Chemistry and Petrochemistry – ICECHIM Bucharest, the **Romanian Chemical Society,** member of EuChemS, aims to bring together all those with higher education involved in research and design, education, industry, other sectors of the economy and society useful fields, in order to develop and achieve the following objectives:

- Promotion of chemistry in all respects;
- Organization of communication sessions, symposia, seminars, workshops, conferences or congresses of national and international interest.

On January 24, 1919, enthusiastic chemists from Romania met at the Analytical Chemistry Laboratory of the University of Bucharest to establish the scientific society called the ROMANIAN CHEMICAL SOCIETY (SChR).

Without a moment of dissolution during the war and the post-war period, SChR had a fruitful activity only two decades after its creation. Only after 1992 the scientific life of the Romanian Chemical Society was resuscitated: objectives were defined, organizational actions were taken, branches were established throughout the country, and international contacts were established and developed.

Since then, SChR has been organizing annually various scientific events for both young and renowned chemists, and editing publications of interest to chemistry lovers. Remarkable is the initiative to indicate in the "Chemical Bibliography in Romania" all the original works published in our country, accompanied by the exact quote of the original work. Also, original results have been published in international languages in the „Bulletin of Pure and Applied Chemistry".

Romanian Chemical Society actively promotes not only the established researchers, but also encourages the young researchers, at the beginning of their career, offering awards in the scientific meetings in which it is co-organizer and partner for the most valuable works.

For more information regarding the Romanian Chemical Society, please visit http://www.schr.ro or contact us:

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FOREWORD

Welcome to the latest edition of the Exploratory Workshop "INNOVATIVE CROSS-SECTORAL TECHNOLOGIES - NeXT-Chem", a forum that has established itself as a beacon for young scientists to showcase their groundbreaking achievements in inter- and trans-disciplinary research. With each passing year, this workshop continues to foster collaboration, inspire new ideas, and shape the future of scientific exploration.

At its sixth edition, the NeXT-Chem workshop remains dedicated to providing a platform for young researchers, M.Sc. and Ph.D. students, to present their latest discoveries and gain invaluable insights through invited lectures. As usual, participation in this enriching experience is completely free, ensuring equal access for all passionate minds.

The overall number of participant registrations careered to previous editions and amounted to 43, seconded by additional registered participants who have requested video proceedings of the scientific event due to scheduling conflicts. All enrolled scientific papers abstracts have undergone the scrutinity of the reviewers' panel as per the inter pares evaluation methodology applicable.

In Section 1- Multifunctional materials, nanocomposites, innovative technologies and cultural heritage preservation, 28 oral presentations for scientific contributions were delivered. Their topics were alligned with top directions of research in organic chemistry, inorganic chemistry and polymer chemistry. The new materials have potential applications in areas of great socio-economic interest: Biomedical, Cultural Heritage Protection, Electronics Engineering, Agriculture and Environment, Energy, Industrial products development.

In Section 2- Bioresources, biotechnologies and biorefining, 15 oral presentations and scientific contributions were delivered. Their topics consisted of research in the field of biotechnology, biochemistry and biophysics. New technologies and materials have applications in many fields of great socio-economic importance: Food industry, Agriculture, Industrial applications, Biomedical, Environment and Construction.

Oral communications enrolled in the predefined sections were delivered by 20 young researchers affiliated with NIRDCP-ICECHIM and 23 young researchers affiliated with other universities and research institutes in Romania and abroad:

- United States of America, Georgia Institute of Technology;
- India, Dr. B. R. Ambedkar National Institute of Technology, Punjab / Babasaheb Bhimrao Ambedkar University, Uttar Pradesh/ Government SSP College Waraseoni, Balaghat/ Christ Church College, Kanpur/ Institute of Nuclear Medicine and Allied Sciences, Delhi/ University of Delhi;
- Mexico, Autonomous University of Puebla;
- Pakistan Abdul Wali khan University Mardan / Shaheed Benazir Bhutto Women University/ COMSATS University Islamabad;
- France, UMRt INRAE, Université de Lille
- Republic of Moldova, Nicolae Testemitanu State University of Medicine and Pharmacy
- Greece, National Hellenic Research Foundation Athens

On March 22, starting at 9:00 AM, the HOLTERM project roundtable took place, an attempt to use environmentally friendly materials in the manufacture of holographic marks.

The coordinators of this edition extend their gratitude to all the participants, speakers, and contributors who have made this workshop possible. May this edition of NeXT-Chem be a catalyst for transformative breakthroughs and an inspiration for future generations of scientists.

HOLTERM PROJECT, AN ATTEMPT TO USE ENVIRONMENTALLY FRIENDLY MATERIALS IN THE MANUFACTURE OF HOLOGRAPHIC MARKS (WORKSHOP)

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Keywords: biopolymer; holographic marks; anti-counterfeiting

Introduction: Counterfeiting is a scourge of the present times that equally affects companies, governments, and people. The most important strategy to reduce this phenomenon is the large-scale application of authentication and anti-counterfeiting measures. While completely nullifying counterfeiting is difficult to obtain, the research efforts are focused on methods that make counterfeiting difficult and very expensive. There are several authentication solutions such as holograms, stamps, barcodes, fluorescent inks, and colorimetric labels [1]. From all of these, the holographic marks make possible a higher level of security. A holographic mark is an imprinted micro-relief foil that diffracts the incident wavefront of white light, forming optical images with multiple effects. One common process to obtain holographic marks consists of imprinting a 3D projected model of a hologram from the surface of a master on a polymeric substrate by hot embossing. Polymers from petroleum resources such as polycarbonate (PC) or polymethyl methacrylate (PMMA) are usually employed for this operation. However, PMMA and PC undergo very slow environmental degradation after utilization, which leads to the accumulation of waste and advanced pollution. The objective of the HOLTERM project was the replacement of the synthetic polymer with a biopolymer in the manufacture of the embossing substrate, which should ensure a correct transfer of the microrelief, together with the introduction of a thermochromic element with the role of a sensor to control the preservation of products in negative temperature conditions.

Materials and methods: The plates were obtained by compression molding the biopolymer at its melting temperature and the hot embossing was conducted on an electric press at a temperature close to the glass transition temperature of the biopolymer. The quality of the hot embossed microrelief was characterized by digital holographic microscopy, scanning electron microscopy, and atomic force microscopy.

Results: The results showed that the biopolymer was able to ensure a faithful transfer of the microrelief and the correct formation of the optical image, as shown in Figure 1 - left image. The AFM image (Figure 1 – right) shows the correct replication of the channels and a good spatial resolution.

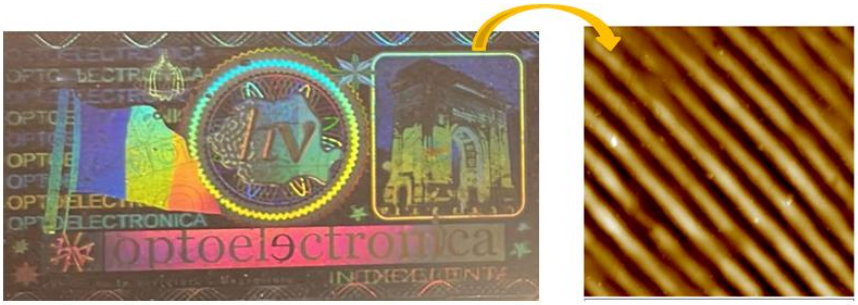

Figure 1. Biopolymer substrate with the imprinted mark (left) and AFM image 12μm×12μm of the replicated channels embossed in the biopolymer substrate (right)

Conclusions: The use of biopolymers in the industrial process of manufacturing holographic marks is an important step in making the rapidly growing field of anti-counterfeiting more eco-friendly.

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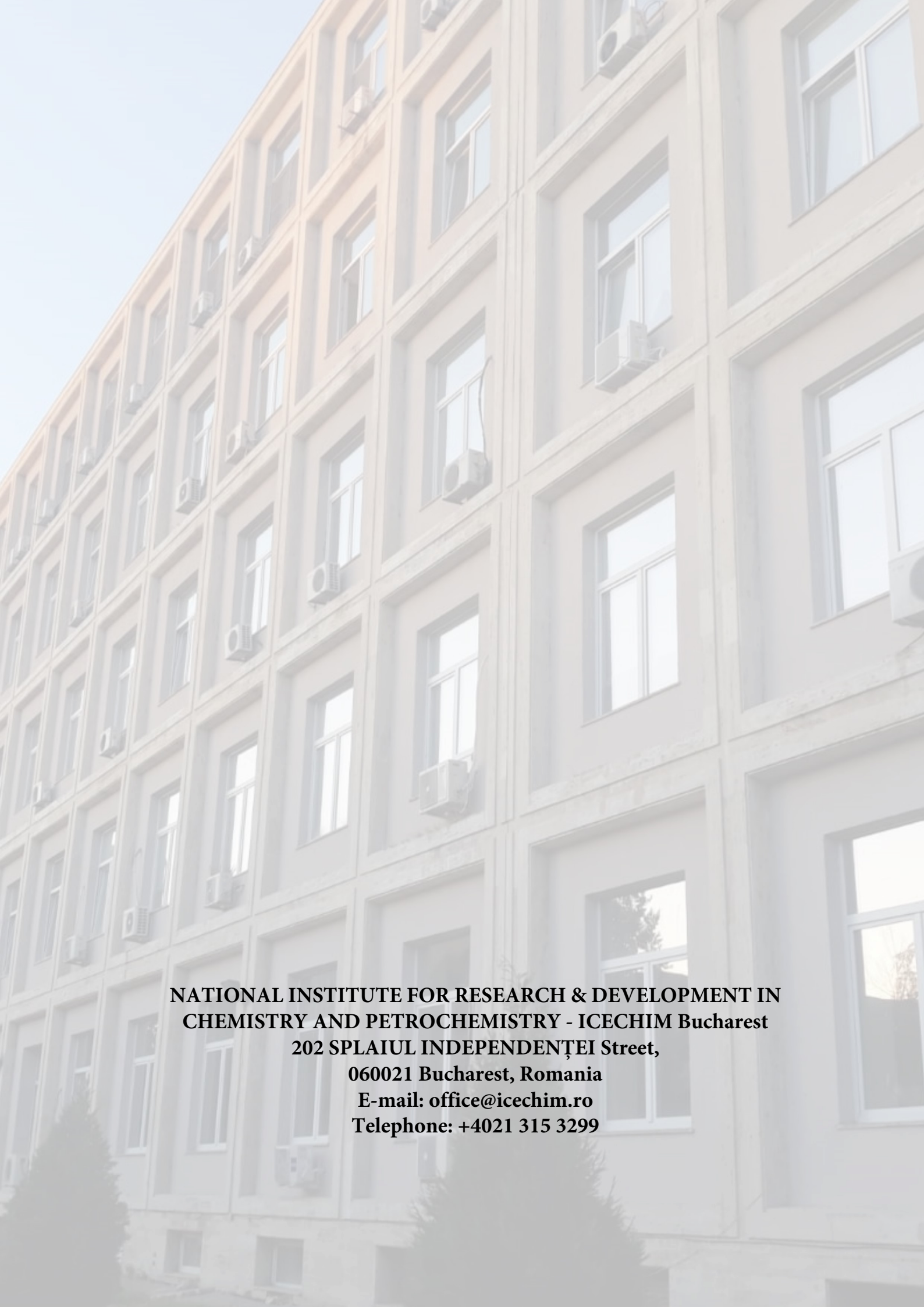
References:

[1]. Çoğun F., Yıldırım E., Arikan M.A.S., Investigation on replication of microfluidic channels by hot embossing, Mater. Manuf. Processes 2017;32:1838–44.



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