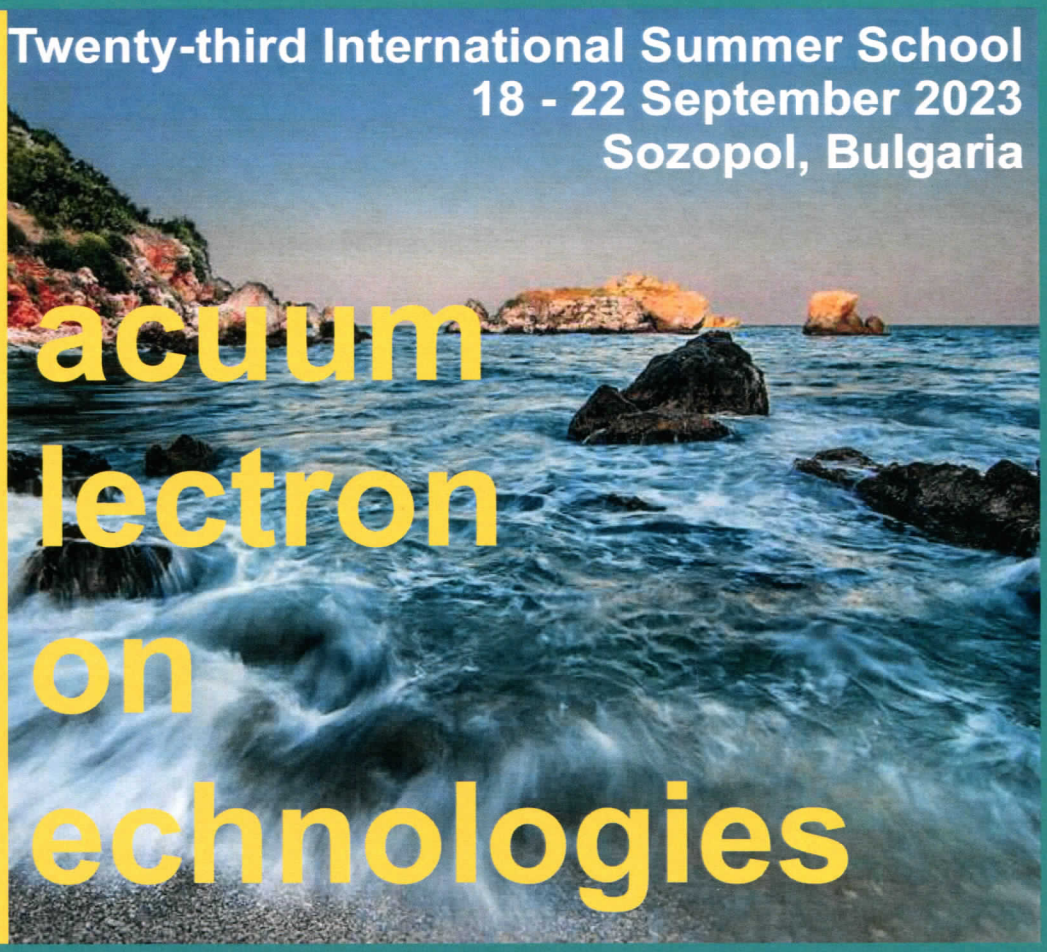
Twenty-third International Summer School
18 - 22 September 2023
Sozopol, Bulgaria



VEIT
Vacuum Electron Ion Technologies

PROGRAM
ABSTRACTS

TWENTY-THIRD INTERNATIONAL SUMMER SCHOOL ON VACUUM, ELECTRON AND ION TECHNOLOGIES

VEIT 2023

18 - 22 September 2023
SOZOPOL, BULGARIA

Jointly organized by the Institute of Electronics of the Bulgarian Academy of Sciences and the Dutch Institute for Fundamental Energy Research, The Netherlands

Dedicated to the 60th Anniversary of the Bulgarian organizer of the event

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Editors: M. Dimitrova, Ch. Ghelev, B. Georgieva and E. Vasileva

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ON VACUUM, ELECTRON AND ION TECHNOLOGIES
18 – 22 September 2023, Sozopol, Bulgaria

ORGANIZED BY

INSTITUTE OF ELECTRONICS
BULGARIAN ACADEMY OF SCIENCES, SOFIA, BULGARIA

DUTCH INSTITUTE FOR FUNDAMENTAL ENERGY RESEARCH
EINDHOVEN, THE NETHERLANDS

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MAIN SCIENTIFIC TOPICS:

- THIN FILMS DEPOSITION
- SURFACES AND THIN FILMS PROCESSING AND ANALYSIS
- COATINGS FOR ADVANCED APPLICATIONS
- NEW MATERIALS
- PLASMA-SURFACE INTERACTION AND PLASMA DIAGNOSTICS
- GREEN TECHNOLOGIES
- MODELING AND COMPUTER SIMULATION

PLENARY AND POSTER SESSIONS:

A: THIN-FILMS DEPOSITION
COATINGS FOR ADVANCED APPLICATIONS

B: NEW MATERIALS. PLASMA-SURFACE INTERACTION AND PLASMA DIAGNOSTICS. GREEN TECHNOLOGIES. MODELING AND COMPUTER SIMULATION

C: SURFACES AND THIN FILMS PROCESSING AND ANALYSIS

ABBREVIATIONS:

TL – TOPIC LECTURE
PR – PROGRESS REPORT
OP – ORAL PRESENTATION
PA – POSTER SESSION A
PB – POSTER SESSION B
PC – POSTER SESSION C

OP–8

LIQUID TREATMENTS BY ATMOSPHERIC PRESSURE PLASMA PIN-JET

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Numerous designs of atmospheric pressure plasma jets (APPJs) that function in contact with liquid samples have been developed in the last decade. When aqueous solutions are exposed to non-thermal plasma, reactive oxygen and nitrogen species (RONS), such as OH, O, O_3, H_2O_2, NO_2^-, NO_3^-, formed in several reactions in the gaseous phase are introduced into the aqueous phase. These reactive species are physiologically significant chemicals that are involved in metabolic activities of the plant cells. Consequently, plasma-treated water (PTW) can be used as a complex chemical reactant in the treatment of numerous biological systems.

A plasma system was investigated with an APPJ with sharped-end powered electrode that generates a streamer discharge above the liquid sample. The plasma source was powered by a continuous kHz signal. As working gases, we used He, Ar, and Ar/air admixtures. We conducted electrical characterization and discharge power measurements to acquire additional information about the treatment stability and plasma properties. Spectrally resolved imaging and optical emission spectroscopy were used to determine the type and the spatial distribution of the excited species created in the plasma-liquid interaction. In order to create PTW, liquid samples placed below the APPJ were treated for different duration times and in different sample volumes. The device was used for treating both clean and contaminated water. Detailed physico-chemical analysis of the treated liquid samples, including reactive oxygen and nitrogen species detection, pH, temperature, and electrical conductivity measurements, was performed after treatments. The treated samples were further used in experiments with biological materials.

The results showed significant differences in the properties of Ar and He plasma and enabled us to link the effects of the treatments with the liquid samples properties. Hence, we were able to produce PTW with particular properties suitable for different applications in the fields of biotechnology and plasma agriculture.

Acknowledgments:
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