

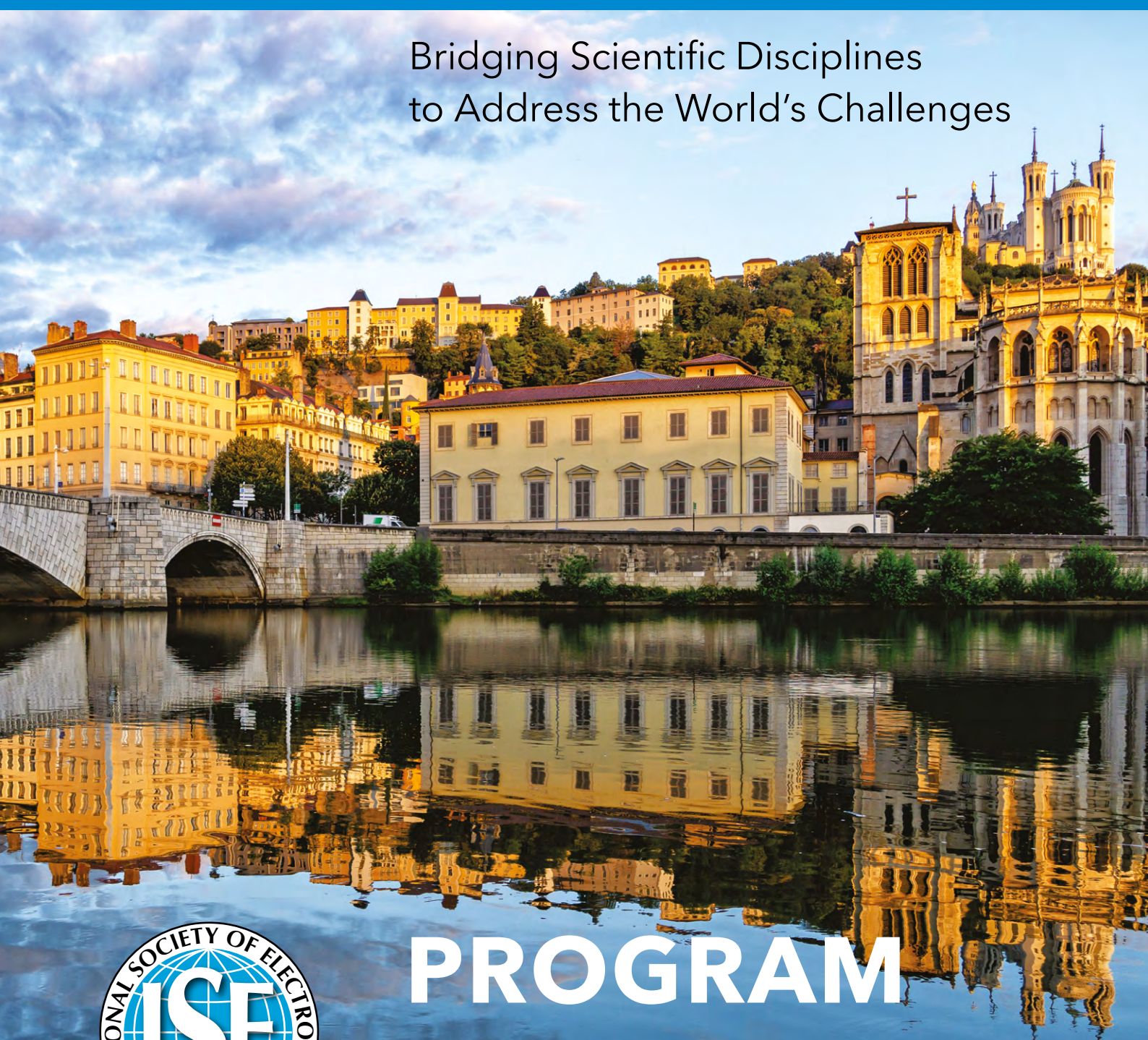
74th Annual Meeting

of the International Society of Electrochemistry

3 - 8 September 2023

Lyon, France

Bridging Scientific Disciplines
to Address the World's Challenges



PROGRAM

<https://annual74.ise-online.org>

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The 74th Annual Meeting of the International Society of Electrochemistry

Bridging Scientific Disciplines to Address the World's Challenges
3 to 8 September 2023. Lyon, France

CENTRE DE CONGRÈS DE LYON - 50 Quai Charles de Gaulle, 69006 Lyon
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S09-P-027

Mikolaj Kozak (*Department of Physical Chemistry and Electrochemistry, Jagiellonian University, Faculty of Chemistry, Krakow, Poland*), Ana Araujo, Lifeng Liu, Grzegorz Sulka, Agnieszka Brzozka
[Electrochemical-thermal synthesis of cobalt selenide nanomaterials for hydrogen evolution reaction](#)

S09-P-028

Pramod Patil Kunturu (*CEPEA, DIFFER, Eindhoven, Netherlands*), Marek Lavorenti, Susanta Bera, Hannah Johnson, Sachin Kinge, Mauritius C.M. van de Sanden, Mihalis N Tsampas
[Scaling up bias-free solar hydrogen production in zero-gap polymeric electrolyte membranes-based photoelectrochemical cells with abundant materials](#)

S09-P-029

Hanh Vi Le (*Institute FOTON, INSA de Rennes, Rennes, France*), Mekan Piriye, Gabriel Loget, Bruno Fabre, Tony Rohel, Karin Tavernier, Julie Le Pouliquen, Rozenn-Gautheron Bernard, Yoan Léger, Nicolas Bertru, Charles Cornet
[Performance of epitaxial GaAs/Si vs GaAs photocathodes for solar hydrogen production](#)

S09-P-030

Peng Li (*College of Chemistry and Molecular Sciences, Wuhan University, Wuhan, China*), Peng Li, Yuzhou Jiao, Yana Men, Shengli Chen
[Interface Mechanism of the Dramatic Activity Gap of Metal-Nitrogen-Carbon Catalysts for ORR in Alkaline and Acid](#)

S09-P-031

Lifeng Liu (*Clean Energy Cluster, International Iberian Nanotechnology Laboratory, Braga, Portugal*), Zhipeng Yu
[Self-supported Bifunctional Integrated Nickel-Iron Phosphosulfide Nanotube Electrodes for Efficient and Stable Seawater Electrolysis](#)

S09-P-032

Sanela Martic (*Forensic Science, Environmental and Life Science, Trent University, Peterborough, Canada*)
[Tuning Reaction Selectivity and Yield for Carbon-Carbon Bond Formation from Substituted Phenols](#)

S09-P-033

Efrosyni Mitrousi (*Chemistry, Aristotle University of Thessaloniki, Thessaloniki, Greece*), Aikaterini Touni, Efrosyni Mitrousi, Angeliki Banti, Eleni Pavlidou, Athanasios Chatzitakis, Sotiris Sotiropoulos
[IrO₂-decorated Titania Nanotubes as Oxygen Evolution Anodes](#)

S09-P-034

Efrosyni Mitrousi (*Chemistry, Aristotle University of Thessaloniki, Thessaloniki, Greece*), Aikaterini Touni, Ioanna Kiourtsi, Efrosyni Mitrousi, Sotiris Sotiropoulos
[IrOx-Pt and IrOx-RuOx Coatings on Ti Substrates as Oxygen Evolution Anodes](#)

S09-P-035

Mohsin Muhyuddin (*Materials Science, University of Milano Bicocca, Milan, Italy*), Mohsin Muhyuddin, Silvia Mostoni, Roberto Scotti, Massimiliano D'Arienzo, Carlo Santoro
[New synthetic strategies for obtaining atomically dispersed Fe-N-C electrocatalysts for oxygen reduction reaction](#)

S09-P-036

Kaito Nagita (*Graduate School of Engineering Science, Osaka University, Toyonaka, Japan*), Shuji Nakanishi, Yoshiharu Mukouyama
[Finite Element Modeling of the Dynamic Changes of Local pH in a Porous Electrode](#)

Influence of Morphology of Sn Dendrites as Sub-layer on Electrocatalytic Performance of Sn-Pd Electrocatalysts

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Sn-Pd electrocatalysts convenient for a possible application in direct ethanol fuel cell were produced by two electrochemical deposition method. In the first step, Sn dendrites of various degree of ramification were electrodeposited by potentiostatically on cathodic potentials of -1200 , -1400 , -1600 and -1800 mV vs. Ag/AgCl. Electrodeposition of tin was performed from 20 g/l $\text{SnCl}_2 \times 2\text{H}_2\text{O}$ in 250 g/l NaOH electrolyte [1] at the room temperature on Cu electrodes. In the second step, Pd was electrodeposited galvanostatically at a current density of -5 mA cm^{-2} on the electrodes with electrodeposited Sn dendrites. Electrodeposition of Pd was performed from 1 M NH_4Cl and 0.01 M PdCl_2 at the room temperature [2]. The processes of electrochemical deposition of Sn and Pd were performed with amounts of the electricity of 400 and 267 mC, giving an atomic ratio synthesized the electrocatalysts of 60 at.% Sn–40 at.% Pd. Morphological and elemental analysis of the Sn-Pd electrocatalysts was performed by scanning electron microscope (SEM) and energy-dispersive X-ray spectroscopy (EDS), respectively. The particle size distribution (PSD) was used to estimate a size of Sn dendrites.

The electrocatalytic activity of synthesized Sn-Pd electrocatalysts towards ethanol oxidation reaction (EOR) was examined by cyclic voltammetry (CV) and chronoamperometry, using 1 M NaOH with 1 M ethanol solution.

Depending on the applied cathodic potentials, the following shapes of dendrites were formed: the needle-like and the spear-like at -1200 mV, an individual fern-like dendrites at -1400 mV, and intertwined network of dendrites of the fern-like shape was formed at cathodic potentials of -1600 and -1800 mV vs. Ag/AgCl. The partial coverage of the Sn dendrites through a formation of compact islands of Pd was attained by electrodeposition of Pd on the electrodes with the Sn dendrites.

It was shown that morphology of the Sn dendrites as sub-layer strongly correlates the electrocatalytic activity of the Sn-Pd electrocatalysts. The largest electrocatalytic activity showed the Sn-Pd electrocatalyst constructed from the individual fern-like Sn dendrites as sub-layer produced at a cathodic potential of -1400 mV vs. Ag/AgCl. This dendrite type showed more branchy morphology than those obtained at the other cathodic potentials. Formation of individual needle-like and spear-like dendrites at a cathodic potential of -1200 mV vs. Ag/AgCl did not contribute significantly to the increase of the initial electrode surface area. On the other hand, due to a high nucleation rate, growth a dendrites from one nucleation centre in more directions, as well as the fact that Sn is very soft metal, morphological characteristics of intertwined Sn dendrites obtained at cathodic potentials of -1600 and -1800 mV vs. Ag/AgCl approached to those of compact massive Sn. The partial coverage of Sn dendrites by Pd can be attributed to the current density distribution effect, because Pd electrodeposition process preferentially performed at the higher parts of the surface area, i.e. on the dendrites, rather than on the flat part of the electrode surface area.

Aside from an influence of degree of branchy of Sn dendrites as sub-layer on the electrocatalytic activity in ethanol oxidation, various electrocatalytic performance of the Sn-Pd electrocatalysts can also be ascribed to the bifunctional effect.

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References:

1. K.I. Popov, M.G. Pavlović, J.N. Jovićević, Morphology of tin powder particles obtained in electrodeposition on copper cathode by constant and square-wave pulsating overpotential from Sn(II) alkaline solution, *Hydrometallurgy* 23 (1989) 127–137.
2. J.D. Lović, V.D. Jović, Electrodeposited Pd and PdNi coatings as electrodes for the electrochemical oxidation of ethanol in alkaline media, *J. Solid State Electrochem.* 21 (2017) 2433–2441.