

**Subject: Joint webinar Division de Chimie du Solide – SCF / Division of Solid State and Materials Chemistry – EuChemS Time: Thursday 12<sup>th</sup> June, 2025 01:30 PM Paris-time**

## **Link Zoom Meeting**

Topic: SCF-EuChems / Pr. Ladislav Kavan

Time : 12 june 2025 01:30 PM Paris

Link Zoom

<https://univ-nantes-fr.zoom.us/j/82839892473?pwd=Pab9yCHaXQIVWuN-myJA6CIF5GA7wIH.1>

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## **Ladislav Kavan**

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**Photoelectrochemistry of TiO<sub>2</sub>, SnO<sub>2</sub>, ZnO:  
Fundamentals, Pitfalls, Applications**

Materials based on TiO<sub>2</sub>, SnO<sub>2</sub> and ZnO triggered the rise of semiconductor photoelectrochemistry in the last century, with pivotal advances in photocatalysis, photovoltaics, and solar fuel generation from, e.g., H<sub>2</sub>O, N<sub>2</sub>, CO<sub>2</sub>. These three materials are currently producing ca. 130 scientific publications daily! This deluge of information causes, however, conflicting interpretations, oversimplifications, and misconceptions, too [1]. Examples are: (i) Determination of flatband potentials and donor concentrations by Mott-Schottky analysis, e.g., for nanotextured materials; (ii) Calculation of work functions and band edges by DFT ignoring the effects of crystal environment and/or imperfections; (iii) Measurement of work functions and band edges by photoelectron spectroscopy (XPS/UPS/NAP) and Kelvin probe; (iv) Application of the classical Gärtner-Butler model for carrier dynamics in semiconductor photoanodes, discounting the gradient of electrochemical potentials for the e<sup>-</sup>/h<sup>+</sup> separation; (v) The “superhydrophilicity” in UV-irradiated titania is caused by selective adsorption/photodegradation of airborne carboxylic acids, rather than by structural modifications of the TiO<sub>2</sub> surface.

[1] L. Kavan, Electrochemistry and band structure of semiconductors (TiO<sub>2</sub>, SnO<sub>2</sub>, ZnO): Avoiding pitfalls and textbook errors, *J. Solid State Electrochem.* **28** (2024) 829-845.