Seminar

Prof. Alain WALCARIUS

Université de Lorraine, CNRS, LCPME
405 rue de Vandoeuvre,
54600 Villers-les-Nancy, France
E-mail: alain.walcarius@univ-lorraine.fr

« Electrogeneration of sol-gel films: a counter intuitive concept for the functionalization and nanostructuration of electrode surfaces »

When and where:

Tuesday December 5th 2023 at 10:45
UNamur, Rue Grafé 2, B-5000 Namur
Faculty of Sciences,
Chemistry & Physics buildings
Auditorium S06

BENOÎT CHAMPAGNE
LCT, UCPTS, UNAMUR
E-MAIL: BENOIT.CHAMPAGNE@UNAMUR.BE

RUE DE BRUXELLES, 61, B-5000 NAMUR
TEL: +32 81 724554

« Electrogeneration of sol-gel films: a counter intuitive concept for the functionalization and nanostructuration of electrode surfaces »

Sol-gel electrochemistry has gained great popularity in the past decades, mostly because of the ease of formation of silica and organosilica films with tailor-made properties that can be advantageously exploited for several applications when coated on a suitable electrode surface. In particular, silica-based materials displaying a regular structure at the mesoporous level have been found to be very promising electrode modifiers [1-3] because they ensure fast mass transport processes [4], which are often ratedetermining in electrochemistry. In this context, an original electrochemical method has been developed to indirectly generate sol-gel-derived (organo)silica thin films, with promising applications in the field of bioelectrochemistry and sensors and beyond. Such electrogeneration of non-electroactive and non-conducting materials constitutes a counter intuitive concept for the functionalization and nanostructuration of electrode surfaces [5]. After a brief introduction to the field, this lecture will present the concept the electrochemically-assisted generation of sol-gel films [6], its interest for bioencapsulation and elaboration of electrochemical bioreactors [7-10], its suitability to get nanostructured electrode surfaces with preferential pore orientation [3, 11, 12], including their modification with organo-functional groups or conducting polymers [3, 13-15] and their permselective properties [16-18], and will end with promising applications in electroanalysis and sensors [19-22], electrocatalysis [22, 23], energy storage [24] or electrochromism [25, 26].

[1] A. Walcarius, Chem. Soc. Rev. 42 (2013) 4098; [2] A. Walcarius, Curr. Opin. Electrochem. 10 (2018) 88; [3] A. Walcarius, Acc. Chem. Res. 54 (2021) 3563; [4] M. Etienne, *et al.*, Anal. Bioanal. Chem. 405 (2013) 1497; [5] A. Walcarius, CR Chim. 26 (2023) 99; [6] E. Sibottier *et al.*, Langmuir 22 (2006) 8366; [7] Z. Wang, *et al.*, Electrochim. Acta 56 (2011) 9032; [8] Z. Wang, *et al.*, Biosensors Bioelectron. 32 (2012) 111; [9] I. Mazurenko, *et al.*, Electrochim. Acta 199 (2016) 342; [10] L. Zhang, *et al.*, ChemCatChem 10 (2018) 4067; [11] A. Walcarius, *et al.*, Nature Mater. 6 (2007) 602; [12] A. Goux, *et al.*, Chem. Mater. 21 (2009) 731; [13] N. Vilà, *et al.*, Angew. Chem. Int. Ed. 53 (2014) 2945; [14] N. Vilà, *et al.*, Adv. Mater. Interfaces 3 (2016) 1500440; [14] A. Gamero-Quijano, *et al.*, Langmuir 33 (2017) 4224; [16] N. Vilà, *et al.*, Chem. Mater. 28 (2016) 2511; [17] C. Karman, *et al.*, ChemElectroChem 3 (2016) 2130; [18] N. Vilà, *et al.*, Electrochim. Acta 309 (2019) 209; [19] M. B. Serrano, *et al.*, Electrochem. Commun. 52 (2015) 34; [20] T. Nasir, *et al.*, ACS Sensors 3 (2018) 484; [21] C. Karman, *et al.*, Electrochim. Acta 228 (2017) 659; [22] H. Maheshwari, *et al.*, ChemElectroChem 7 (2020) 2095; [23] S. Ahoulou, *et al.*, Electroanalysis 32 (2020) 690; [24] J. Wang, *et al.*, Electrochim. Acta 366 (2021) 137407; [25] N. Vilà and A. Walcarius, Front. Chem. 8 (2020) 830; [26] W. Ullah, *et al.*, Faraday Discuss. 233 (2022) 77.