



# THE SALZBERG CHEMISTRY SEMINAR SERIES

The City College  
of New York



**Monday, May 10, 2021 @ 12:00 noon – on Zoom**

**Merging sonication with heterogeneous photocatalysis:  
Environmental and Energy Applications**

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**Abstract:** Mechanochemical approaches, and especially sonication, have a high potential to expand the design and synthesis fields in materials chemistry and process intensification, leading to new surface features with unique multifunctional entities, the deposition of a photocatalyst layer in the internal wall of a microreactor, and improving the kinetics of a plethora of organic reactions. Our latest research efforts have been focused on the development of new synthetic routes by employing sonochemistry as a complementary process and, simultaneously, an intensification tool leading to nanostructured TiO<sub>2</sub> of a high photoreactivity/selectivity, the controlled functionalization with titania of a Teflon-based microreactor, and changing excellently the performances of batch-based liquid phase photocatalytic organic synthesis.

This lecture is a report of selected experiments of titania-based photocatalysis's intensification using flow microphotoreactors for selective photo-oxidation of aromatic alcohols, using sonication to intensify the same type of reaction in the batch system, and the use of sonication's waves for the synthesis of a peculiar TiO<sub>2</sub> with excellent performances in a gaseous phase by decomposing toxic vapors of chemical warfare agents (a mustard-gas surrogate), or in a liquid phase by selectively oxidizing benzyl alcohol, a model lignin-biomass-derived compound. (*Adv. Funct. Mater.*, 31 (2021) 2007115; *Green Chem.*, 22 (2020) 4896; *Mol. Catal.*, 486 (2020) 110884).

**Biography:** Prof. Dr. Juan Carlos Colmenares Q. graduated from Warsaw University of Technology (Chem. Eng. 1995) and obtained his M.Sc. (1997) in catalysis for organic technology and Ph.D. (2004) in chemical and material sciences from the same university, and his scientific degree of habilitation (D.Sc. 2015) from the Institute of Physical Chemistry of the Polish Academy of Sciences in Poland. His interests range from materials science, nanotechnology, and heterogeneous catalysis to biomass/CO<sub>2</sub> valorization, solar chemicals, sonication, photocatalysis, and water/air purification. After obtaining his Ph.D., he worked at the University of Córdoba, Spain (2005–2006) in Prof. Marinas' group as a postdoctoral fellow, and at the University of Southern California, Los Angeles (USA) (2006–2009) in Prof. G. A. Olah's (Nobel Prize in Chemistry) group as a postdoctoral research associate. He is a Marie Skłodowska-Curie fellow. He serves as an expert evaluator for many important scientific journals/institutions and chemical companies (Colombia, USA, Poland, Spain, China), and as a member of the editorial advisory board for *Scientific Reports* and *Molecules (Photochemistry Section)* journals. He has coauthored more than 90+ works published in international scientific journals and books, and filed six patent applications (three accepted). Presently, he is working as an associate professor at the Institute of Physical Chemistry of the Polish Academy of Sciences in Poland.

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