ZNANSTVENO VIJEĆE ZA NAFTNO-PLINSKO GOSPODARSTVO I ENERGETIKU

SEKCIJA ZA PETROKEMIJU

organizira i poziva Vas na predavanje koje će održati

Prof. Dionysios (Dion) D. Dionysiou
Environmental Engineering and Science Program
University of Cincinnati, Cincinnati, Ohio, USA

Treatment of Cyanotoxins and Contaminants of Emerging Concern in Water Using Advanced Oxidation Processes

u četvrtak, 04. svibnja 2017. u 11 sati

u maloj dvorani palače Hrvatske akademije znanosti i umjetnosti
Trg N. Š. Zrinskog, Zagreb

Professor Dionysios (Dion) D. Dionysiou is currently a UNESCO co-Chair Professor on "Water Access and Sustainability" and a Herman Schneider Professor of Environmental Engineering at the University of Cincinnati. He teaches courses on drinking water quality, treatment and reuse, advanced unit operations for water treatment, advanced oxidation technologies, and physical-chemical processes for water quality control. Professor Dionysiou is leading several projects of local, state, national and international importance focused on water quality, treatment, reuse, and monitoring. His work encompasses surface water, groundwater, agricultural water, and industrial waters of complex mixtures. His research interests include (i) physical chemical processes for water treatment, (ii) urban water quality, (iii) advanced oxidation processes, (iv) UV and solar light-based remediation processes, (v) treatment of contaminants of emerging concern (i.e., pharmaceuticals and personal care products, biotoxins, heavy metals), (vi) remediation of Harmful Algal Blooms/cyanotoxins, (vii) environmental nanotechnology and nanosensing, (viii) water-energy-food (WEF) nexus, and (ix) water sustainability. Several of his current projects are focused on the treatment, sensing and monitoring of cyanotoxins formed in freshwater aquatic systems such as Lake Erie and several inland lakes and rivers in Ohio.

E-mail: dionysios.d.dionysiou@uc.edu . Tel: +1-513-556-0724; Fax: +1-513-556-4162;

Summary:

Advanced Oxidation Processes (AOPs) are gaining popularity for the removal of contaminants of emerging concern, especially for applications in the purification of drinking water, treatment of wastewater effluent (i.e., for discharge or reuse applications), decontamination of industrial effluents, and remediation of groundwater. Homogeneous and heterogeneous AOPs are currently intensively explored, modified, and optimized for applications as stand-alone technologies or integrated with other processes in the overall treatment train. Several new AOPs demonstrating promising results have been developed in recent years. While most of these technologies are based on hydroxyl radical as oxidizing species, some AOPs involve other radical species such as sulfate radical and superoxide anion radical, which are also more selective. While less efficient for destruction of organic contaminants, superoxide anion radical can play a significant role in water disinfection by solar light. Recent interest has also spurred in reductive pathways of AOPs for application in reduction of metals, nitrate, bromate and other species of importance in water quality. More recent studies have also delved into mechanistic insights of AOPs, including identification of reaction intermediates, unveiling reaction pathways, determination of treated solution toxicity, and the role of water quality on the reaction mechanisms and reaction kinetics. Recent progress in nanotechnology also propelled new advances in the field of heterogeneous AOPs. The use of solar light by some of these processes (i.e., solar photocatalysis, solar photoelectrocatalysis, solar disinfection) has expanded potential application in parts of the world that have plenty of sunlight but also have critical needs in water quality and energy generation. In this presentation, Professor Dionysiou will overview mechanistic transformation pathways of treatment of cyanotoxins and other contaminants of emerging concern in water using AOPs. Emphasis will be given on UV and Solar-based Advanced Oxidation Processes such as TiO_2-based photocatalysis (UV and visible) (i.e., a heterogeneous AOP) and UV/H_2O_2 process (i.e., a homogeneous AOP). Details will be presented on the degradation of cyanotoxins and other selected contaminants. Most emphasis will be placed on the oxidative pathways for the degradation of microcystin-LR and cylindrospermopsin. Transformation kinetic rates and reaction intermediates formed by OH radical attack and other reactive oxygen species on specific sites of the target contaminants will be presented and the detailed reaction pathways will be discussed. Discussion will also be provided when oxidation takes place by other radicals such as sulfate radicals and superoxide anion radicals under certain modifications of the processes described above. The role of water quality parameters such as natural organic matter, alkalinity and pH will be discussed, considering also the chemistry of the target contaminants and, in the case of heterogeneous AOPs, the role of the catalyst nano-interface.