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## **CiQUS** Lecture



## **Prof. Elin L. Winkler**

Magnetic Nanocatalysts: Identification and optimization of free radical's generation for organic contaminant degradation

CONICET

FONDO EUROPEO DE DESENVOLVEMENTO REXIONAL PO FEDER Galicia 2014-202 - Unha maneira de facer Europ

Friday, June 30, 2023 12:15 p.m. - CiQUS Seminar Room

## Abstract:

Environmental remediation processes based on the catalytic activity of magnetic nanoparticles have gained considerable attention in recent years. One promising example is the use of ferrite nanoparticles as heterogeneous catalysts of the Fenton reaction that generates reactive oxygen species (ROS). The ROS production results from the decomposition of  $H_2O_2$  into highly oxidative species such as hydroxyl (•OH) and hydroperoxyl radicals (•OOH) at the surface nanoparticles, which ones have an effective capacity to induce the degradation of organic pollutants. The catalytic reaction depends on the nanoparticle composition and coating, and also the surface oxidation state and crystalline symmetry of the active ions. In particular, by the Electron Paramagnetic Resonance (EPR) spectroscopy, using spin trapping techniques, it is possible to identify and quantify the different reactive species produced in the different conditions.

In this talk I will present the study of the ROS generation by different ferrites (MFe2O4, M= M= Fe, Cu, Ni, Mn, Zn) and their efficiency to degrade model dyes under different pH, temperature and buffers conditions. This behavior can be correlated with the particular reactive species produced in each case. Furthermore, the efficiency of the process can be potentiated by increasing the temperature of the medium, which can be made by an external heating and also adjusting the magnetic properties to produce magnetic hyperthermia in presence of ac magnetic field. We show that iron oxide nanoparticles that induce magnetic hyperthermia improve reaction rates and enhance the degradation and mineralization of real wastewater samples. This knowledge gives us a tool to engineer proper materials to optimize the degradation reaction of different organic molecules.

## Biosketch:









**Elin L. Winkler** is Researcher of National Council for Scientific and Technical Research (CONICET), Researcher of National Atomic Energy Commission (CNEA) and Head of the Magnetic Resonance Lab at the Bariloche Atomic Center (CAB-CNEA). She is also Professor at the Balseiro Institute, Cuyo National University (IB-UNCuyo) in Argentina. Her research activity is mainly focus on the designs and fabrication of new nanostructured materials based on magnetic nanoparticles, the study of their physicochemical properties to tuning of their response for different applications. In this area she is co-author of more than 80 papers in peer-review journals, three book chapters and more than 100 contributions to local and international conferences.