

# nanoSeminar Series 2022

Institute for Materials Science

**Prof. Dr. Carlos Garcia**

Department of Chemistry, Clemson University

**(not only) Size matters: Development of simple approaches to facilitate the application of microfluidic devices, nanomaterials, and electrochemical processes.**

Thursday, June 30<sup>th</sup> 2022

13:00 – 14:00

Normal: Seminar Room 115, Hallwachsstr. 3 (HAL)

Pandemic version: <https://tinyurl.com/nanoSeminar-GA>

Over the last few decades, the concept of miniaturization has been actively explored for the development of more efficient analytical strategies and number of platforms have emerged for high-throughput molecular measurements. Towards this goal, our group is focused on the development of integrated analytical approaches that span from highly specialized instrumentation to simple paper-based devices. Applications of these projects include the quantification of biomedically-relevant analytes, the design of biocatalysts, and the implementation of artificial intelligence to address analytical problems and real samples. Considering the advantages and limitations of these approaches, this presentation will cover three different alternatives that implement simple redox chemistry and/or separations into the analytical workflow. First, implementation of controlled oxidation steps (chemical, electrochemical or photochemical) will be discussed as a simple way to facilitate analysis by capillary electrophoresis. Next, the development of new materials (carbon-based) and their use as detectors for microfluidic devices will be presented considering the kinetics of the adsorption step and the potential use of electrochemical means to control it.

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Dr. Garcia received his B.S. in Biochemistry and Ph.D. in Chemistry from the National University of Cordoba (Argentina) in 1996 and 2001, respectively. During that period of time, he was a TA for the INFIQC/Department of Physical Chemistry and taught several courses at the undergraduate and graduate level. From 2002 to 2004, he was a postdoctoral fellow at Mississippi State University and Colorado State University under the supervision of Dr. W. Wilson and Dr. Charles Henry, respectively. In September of 2004, he joined the faculty at The University of Texas at San Antonio as an Assistant Professor of Analytical Chemistry. He was promoted to Associate Professor with tenure in 2010 and to Professor in 2014. In Aug 2015, he joined Clemson University. In 2018 he was elected Fellow of the Royal Society of Chemistry. His group is focused on the study of interactions of proteins with nanostructured surfaces and their use in analytical chemistry. Additionally, he is developing microfluidic devices to monitor biologically active compounds. Dr. Garcia is engaged in various professional activities which provide opportunities to recruit graduate students and to inform the public about the chemistry program at Clemson. These include the presentation of seminars at colleges and universities, and the presentation of posters at national and international meetings. At present, Dr. Garcia directs the thesis research of two chemistry graduate students (Ph.D. program). Dr. Garcia also has a substantial research program with undergraduates students, which complements and supports the research of graduate students. The outcomes of the research activities have been presented and recognized at national and international scientific meetings and are regularly published in peer-refereed journals, all of which have students as coauthors. His research has received support from the National Institutes of Health, National Science Foundation, National Agency for Space and Aeronautics, and the Office of Naval Research.