



**Theoretical and Physical Chemistry Institute
National Hellenic Research Foundation
Vass. Constantinou 48, Athens**

ONLINE LECTURE

**“Novel Magnetic Nanostructures for high-performance
biomedical and energy applications”**

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Nanostructured Materials (CMNM),
Institute of Nanoscience and Nanotechnology,
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Novel Magnetic Nanostructures for high-performance biomedical and energy applications

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Magnetic nanomaterials have been the focus of considerable scientific attention during the last two decades owing to their applications in specialized areas such as medicine, cancer theranostics, bio-sensing, energy and the environment. Demands for eco-friendly and cost-effective nanomaterials with magnetic thermal stability at elevated temperatures and bio-compatibility open new ways of research towards novel magnetic nano-architectures with exceptional magneto-thermo-electric properties. Defining proper conditions for optimization and absolute control of these properties is a challenging issue for both experimentalists and theoreticians.

In this lecture, we will discuss our research efforts of designing magnetic nanostructures for specific biomedical and energy applications. In the first case our studies on complex magnetic nanostructures composed by bi-magnetic nanoparticles with core/shell morphology, highly promising materials for magnetic hyperthermia and MRI applications, will be presented. In the second case the ionic liquid based ferrofluids as novel thermoelectric materials for waste-heat recovery applications, which demonstrate high thermoelectric efficiency, will be discussed. Special attention will be given to the surface engineering of the magnetic nanoparticles and the importance of the surfactant coverage to the magnetic behaviour of the studied systems.

In all cases the role of the numerical simulations and computational modeling at an atomic and mesoscopic scale in designing next-generation magnetic nanostructures will be highlighted, and comparison with available experimental findings will be discussed.

Selected References

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5. M. Vasilakaki, N. Ntallis, N. Yaacoub, G. Muscas, D. Peddis, K. N. Trohidou, [*Nanoscale*, 45 \(2018\) 21244-24253](#)
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