

Functional magnetic oxides for nanomedicine and spin caloritronics

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ABSTRACT

Magnetic nanoparticles are promising for nanomedicine applications such as contrast enhancement in MRI and magnetic hyperthermia treatment of cancer. There is a need to improve the specific absorption rate (SAR) and heating efficiency of nanoparticles for hyperthermia and our recent work has focused on the role of surface and interfacial anisotropy with a goal to enhance SAR. We present strategies that go beyond simple spherical structures such as core-shell, exchange-coupled nanoparticles, nanowire, nanotube geometries that can be exploited to increase saturation magnetization, effective anisotropy and heating efficiency in magnetic hyperthermia treatment of cancer cells. In another project we are exploring the generation of pure spin currents in magnetic oxides and their coupling with heat through spin Seebeck effect (SSE) experiments. Our experiments have revealed important correlations between effective magnetic anisotropy on the longitudinal SSE in YIG/Pt structures. There is a critical need to improve the spin mixing conductance across interfaces in SSE structures and devices and we demonstrate this is feasible through organic semiconductor buffer layers having large spin relaxation length. Overall I will present the importance of surface and interface anisotropy in magnetic materials that can be tuned for obtaining functional responses for a variety of applications.

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Biographical sketch:

Hari Srikanth is a Professor of Physics at the University of South Florida in Tampa, FL. He received his Ph.D. in experimental condensed matter physics from the Indian Institute of Science (Bangalore) in 1994. After postdoctoral research for several years, Hari joined the University of South Florida in 2000 as an Assistant Professor and established the Functional Materials Laboratory. He became a Full Professor in 2009. Hari's research spans a wide range of topics in the area of magnetism and magnetic materials. Current research focus in his group include investigating magnetization dynamics in nanostructures, exchange bias, magnetic refrigerant materials, giant magneto-impedance (GMI), microwave materials, complex oxides with competing magnetic phases, spin caloric effects and applications of magnetic nanoparticles in nanomedicine.



He has over 245 journal publications and holds 2 patents and has given over 150 invited talks and pedagogical tutorials around the world. Hari is a Fellow of the American Physical Society, Fellow of Institute of Nanotechnology, Marie Curie Fellow and a senior member of IEEE. He is currently an Associate Editor for *Journal of Applied Physics*. Hari has been associated with the Magnetism and Magnetic Materials (MMM) conferences for several years as a program and steering committee member, publication editor and publication chair. He is one of the publication chairs for the 2018 International Conference on Magnetism (ICM) to be held in San Francisco. His research program over the years has received funding from the US Department of Energy, Army Research Office, National Science Foundation, Bizkaia Talent Program (Basque Country, Spain). Hari has held several short term visiting professor positions in Europe at Slovak Academy of Sciences (Kosice), Basque Center for Materials (Bilbao) and in Asia at Indian Institute of Science (Bangalore) and Indian Institute of Technology (Bombay).