INDIAN ASSOCIATION FOR THE CULTIVATION OF SCIENCE
2A & 2B, Raja S.C. Mullick Road, Jadavpur, Kolkata-700032, India

Seminar Notice

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School of Physical Sciences

Title:	**Perspectives on processing magnetocaloric transition-metal borides for solid state cooling applications.**
Speaker:	**Dr. Radhika Barua, Department of Mechanical & Nuclear Engineering, Virginia Commonwealth University**
Date:	**July 22, 2022 (Friday)**
Time:	**12:00 hours (IST)**
Venue:	**Physics Seminar Room (C-406), 3rd Floor, Centenary Building, IACS**
Abstract:	In the United States, residential and commercial buildings currently account for 72% of the nation's electricity use and 40% of carbon dioxide (CO_2) emissions annually, 15% of which originates from air conditioning and refrigeration systems. Novel cooling technologies are required to minimize global energy consumption and environmental impact. To this end, solid state magnetic cooling devices enabled with the "*magnetocaloric*" class of functional materials are attractive as they allow complete elimination of conventional high-global warming potential (GWP) refrigerants and have the potential for efficiency improvements of up to 25% over conventional vapor compression systems, which is equivalent to 60% of Carnot efficiency Within this context, this talk will address the major principles gui ding the development of magnetocaloric transition-metal borides for active magnetic regenerator (AMR) magnetic cooling devices. Spec ific attention will be given to current research efforts for processing $AlFe_2B_2$ – a rare-earth-free intermetallic alloy that exhibits a modest magnetocaloric response corresponding to a n adiabatic temperature change of 2.2 K and magnetic entropy change of 4.4 J/kgK at an applied magnetic field of 2 T. Computational and experimental results will be presented to demonstrate that spin-orbit coupling in the layered orthorhombic $AlFe_2B_2$ crystal structure results in an anis otropic magnetocrystalline energy, thus producing an associated anisotropic magnetof unctional response. Further, the influence of compositional variation on the magnetic properties of $AlFe_2B_2$ will be presented. Conceptual designs for magnetocaloric heat regenerators for refrigeration will also be discussed and some guidelines for future research in th e field will be provided.

All are cordially invited to attend the Seminar

Perspectives on processing magnetocaloric transition-metal borides for solid state cooling applications

Radhika Barua

College of Engineering, Virginia Commonwealth University, VA

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Biography: Radhika Barua is an Assistant Professor in the Department of Mechanical and Nuclear Engineering in the College of Engineering at Virginia Commonwealth University in Richmond, VA. She holds a Ph.D. and M.S. degree in Chemical Engineering (specializing in Materials Science) from Northeastern University, and a B.E. degree in Chemical Engineering from Visveswaraiah Technological University in India. Her research interests are focused on development of advanced functional magnetic materials and devices for diverse applications in the power and energy sector, including magnetic refrigerators, thermal energy harvesting devices, sensors/actuators for harsh environments and permanent magnets. Currently, she has over 40 peer-reviewed publications and three patents. Her research is supported primarily by the Commonwealth Center for Advanced Manufacturing CCAM, Commonwealth Cybersecurity Initiative CCI and VentureWells Foundation. In service to the scientific community, she serves as the chair of the Richmond Chapter of the IEEE Magnetics Society and the IEEE Women In Engineering Affinity Group.