MRS-T 中國材料科學學會
Materials Research Society-Taiwan

Invited speaker's information form of IUMRS-ICA2017

Presentation on Symposium of "smart materials (D7)"

Presentation title: ***Visualizing and measuring nanomechanical actuation in VO_2 across phase transition***

Speaker's name and affiliation: Dr. Viswanath Balakrishnan & Assistant Professor, Indian Institute of Technology(IIT) Mandi, Himachal Pradesh, India

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Brief biography of Speaker:

Dr. Viswanath Balakrishnan received his PhD at Indian Institute of Science (IISc), Bangalore for his work on growth of nanoscale materials and their properties in 2008. He spent around 4 years in Harvard University as postdoctoral fellow and investigated growth of thin films and phase transition with aid of electron microscopy. Then he worked at Massachusetts Institute of Technology (MIT) as post-doctoral associate for a year and carried out CVD growth of carbon nanotube forest and Graphene along with in situ TEM studies for developing mechanistic understanding of CNT growth and self-organization. Dr. Viswanath joined as assistant professor at Indian Institute of Technology (IIT) Mandi in 2014. His current research objective is to achieve controlled growth of various 1D, 2D materials and thin films to overcome the fundamental challenges in nanomanufacturing and to develop devices. Dr. Viswanath published 49 peer reviewed international journal articles in the area of materials science and engineering. His research group is focused towards industrial needs in the areas of nanoelectronics, nanomechanics, energy, smart materials and sensors.

Abstract:

Visualizing and measuring actuation across the phase transition at smaller length scale provide platform for designing smart materials for actuators, cantilevers and strain sensor applications. While the measurements of actuation by optical or electrical methods are routinely achievable, capturing the actuation along with its cause at structural and microstructural level is very intricate especially when the actuation is driven by phase change. In addition, probing the growth of domains and their local mechanical and electrical properties at nanoscale across the phase transition is an important task for developing tiny strain sensors, cantilevers and actuators. We present nanomechanical behavior of insulating and metallic domains that co-exist near metal insulator transition temperature of 68°C in VO_2. Optical identification of insulating and metallic domains and their growth dynamics were captured prior to nanoindentation during heating and cooling experiments. We also developed novel technique to visualize and quantify the nanomechanical actuation arising due to phase transition in VO_2 thin films and microbeams.

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