SCDT – FlexE Centre Webinar Series

The webinars aim to bring together researchers in Flexible Electronics and allied areas from across India (and other countries) on a single platform to promote professional interaction.

Webinar by

Dr. Tapajyoti Das Gupta
Department of Instrumentation and Applied Physics, Indian Institute of Science, Bangalore

on
"Soft, Responsive, and Large-Area Photonics Enabled by Fluidic Self-Organization"

Date: 16th December, 2025
Time: 7:30 PM to 8:30 PM

Visit www.iitk.ac.in/scdt/webinars.html to access the zoom link to join the webinar.

The event will be chaired by
Dr. Devika Kataria
JK Lakshmipat University, Jaipur

Abstract of the Webinar

Modern optoelectronic devices demand nanometre-scale control of feature size, shape and spatial arrangement over large and flexible substrates—requirements that surpass conventional lithography and self-assembly.

We introduce a fluid-instability-driven self-assembly method for thin glass and polymer films that achieves sub-10-nm feature definition and wafer-scale patterning of all-dielectric metasurfaces.

This approach enables precise tuning of lattice geometry and particle dimensions, yielding sharp Fano resonances with record-high visible-range Q-factors (~300) and high-purity structural colours.

By engineering the thermal-expansion mismatch between films and substrates, we further realize large-area periodic structures with dynamically tunable optical responses, including mechanochromic and camouflage effects. Finally, we demonstrate a liquid-metal–based soft photonic platform where controlled Ga nanodroplet formation produces vibrant structural colours and robust reflective display behaviour.

The resulting devices exhibit high-fidelity mechanochromic sensing with stable optical performance over 1000 strain cycles.

Together, these results establish a unified, scalable, fluid-based nanomanufacturing framework for reconfigurable photonics and large-area functional thin-film devices.

Information about the speaker

Dr. Tapajyoti Das Gupta is an Assistant Professor in the Department of Instrumentation and Applied Physics at the Indian Institute of Science (IISc), Bangalore. He received his B.Sc. and B.Tech from the University of Calcutta, followed by an M.Sc. in Nanoscience and a Ph.D. in Condensed Matter Physics from École Polytechnique, France. Prior to joining IISc, he worked at EPFL, Switzerland, in the FIMAP group in Materials Science Department as a post doc. At IISc, Dr. Das Gupta leads the Laboratory of Advanced Nanostructures for Photonics and Electronics (LANSPE), where his research focuses on scalable nanomanufacturing, dielectric metasurfaces, soft and stretchable photonics, liquid-metal optics, and large-area functional thin-film devices. His work integrates fluid-based fabrication, nanoimprinting and hybrid material systems to realize high-performance optical and optoelectronic structures. He has published extensively in nanophotonics and advanced materials, contributing new concepts for dynamically reconfigurable and high-throughput photonic technologies..

Samtel Centre for Display Technologies (SCDT) and the National Centre for Flexible Electronics (FlexE Centre) of IIT Kanpur are dedicated to flexible electronics research and commercial deployment respectively

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