

# Optofluidic Silicon Metasurfaces for Passive Cooling, Heating and Water Harvesting

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In this talk, we report on independent control of optical and wetting properties of silicon surfaces. Various surface functionalization include micro- and nanoscale structuration, nano-coatings and chemical treatments. Radiation properties are investigated in the infrared spectral range from visible to mic-infrared, up to 25  $\mu\text{m}$ , where high emissivity levels exceeding 99.9% are achieved. We then demonstrate experimental evidence of the resulting meta-surfaces for radiative cooling and heating, which are further applied for Atmospheric Water Harvesting (AWH) and Enhanced Solar Steam Generation (ESSG) for water purification.



**Short Bio:** Prof. Tarik Bourouina has obtained his Ph.D. in 1991 and his Habilitation (HDR) in 2000 from Université Paris-Saclay. He has been Professor of Physics at ESIEE Paris, Université Gustave Eiffel since 2002. He is also affiliated to the French National Center for Scientific Research (CNRS), within the CINTRA laboratory IRL 3288 in Singapore jointly with Nanyang Technological University (NTU) and THALES, and within the ESYCOM laboratory UMR9007 in France. Formerly, he took several positions in France and in Japan; at Université Paris-Saclay (1995-1998) as Associate Professor in IEF Lab (CNRS UMR 8622), at the French National Center for Scientific Research (CNRS) and at The University of Tokyo (1998-2001) in LIMMS Lab (CNRS UMI 2820). In 2017, he was the recipient of the Chinese Academy of Sciences President's Fellowship. Dr. Bourouina serves as an Editor in two journals of Nature Research: 'Light: Science and Applications' and 'Microsystems and Nanoengineering'. He also serves as Associate Editor in "Advanced Devices and Instrumentation" -a Science-Partner Journal. He

has many contributions in the development of several companies, which include Si-Ware Systems, Fluidion, Memscap and Izonics.