

# Joint Analytical & Materials Seminar

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*“Temperature metrology of tomorrow: Ultra-high resolution photonics-based thermometry on a chip”*

Temperature is one of the most commonly measured physical parameters and its precise and accurate metrology is vital for almost all areas of science and technology. Current standards and sensors for temperature rely mostly on more than century-old resistance-based metrology infrastructure, which almost reached its fundamental limits in measurement science. To drastically improve temperature metrology and to reduced sensor ownership cost we proposed a completely novel approach, which is based on recently emerged and rapidly growing photonics technology. In this presentation, I will show the results in developing novel on-chip integrated silicon photonic temperature sensors with nanoscale footprint and ultra-high resolution as an alternative solution to legacy-based resistance thermometers. I will describe nanofabrication, fiber coupling and chip packaging. I will also present a direct comparison of our photonic nanothermometers to Standard Platinum Resistance Thermometers, the best in class resistance temperature sensors used to disseminate the International Temperature Scale of 1990. The preliminary results indicate that our photonic nanothermometers are capable of detecting changes of temperature as small as sub-10  $\mu\text{K}$  and can achieve measurement capabilities that are on-par or even better than the state-of-the-art resistance thermometry.

**Thursday, October 5 at 12:15 pm**  
**Room 1315 Chemistry**