



Technical Talk – Exploring Natural and Bio-Inspired Photonic Nanostructures as Gas Sensors: From Scientific Curiosity to Societal Impact

By

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He is the eETD chairman for 2025/2026 session.

The Institution of Engineers, Malaysia (IEM), through the Electronic Engineering Technical Division (eETD), in collaboration with the IEEE Sensors and Nanotechnology Council Malaysia Joint Chapter, successfully organised a Technical Talk at CEDEC, Universiti Sains Malaysia (USM), on 12 September 2025. The event featured Dr Radislav A. Potyrailo, Principal Scientist at GE Vernova Advanced Research Center, who delivered a lecture titled “Exploring Natural and Bio-Inspired Photonic Nanostructures as Gas Sensors: From Scientific Curiosity to Societal Impact.”

The event attracted 37 participants, including researchers, faculty members, postgraduate students, and industry professionals. It provided valuable insights into cutting-edge sensor research and its translation into impactful industrial and societal applications.



Figure 1: Participants at the technical talk

Dr. Potyrailo, a globally recognised researcher with more than 150 patents and publications and an IEEE Fellow, shared his pioneering work in leveraging bio-inspired photonic nanostructures for advanced gas sensing. Drawing inspiration from the iridescence of tropical butterfly wings, he explained how tree-like nanostructures that manipulate light can be engineered into next-generation sensors. His research emphasises multi-variable sensing within a single nanostructured unit, enhancing selectivity, stability, and resilience in challenging environments.

He also highlighted GE's industrial R&D vision in sensing—to continuously develop new sensor capabilities and accelerate their transition from laboratory prototypes to real-world applications. This approach has enabled GE to deploy innovative sensing solutions across industries such as energy, water, oil and gas, and renewable systems, creating tangible impacts on industrial operations and sustainability.



Figure 2: Dr. Potyrailo highlighting the GE R&D sensing goal

The talk further showcased how these innovations are redefining gas sensor design by overcoming the limitations of conventional sensor arrays, reducing ageing effects, and integrating machine learning for real-time multi-gas detection. Applications span industrial safety, environmental monitoring, urban pollution tracking, medical diagnostics, and homeland security. Importantly, Dr Potyrailo emphasised the societal impact, demonstrating how affordable multi-gas sensing solutions can support global sustainability and safeguard public health.

He also shared examples of GE projects that have been successfully commercialised, ranging from wireless gas sensors to multi-parameter oil and water sensing systems. His discussion underscored the importance of bridging fundamental research with commercialisation, enabling practical technologies that address industrial and environmental challenges.

In closing, Dr Potyrailo stressed the importance of breaking fundamental trade-offs in sensor design—specifically size, weight, power, and cost versus performance. Achieving this balance, he noted, is crucial to enabling affordable, scalable, and high-performance multi-gas sensing solutions with broad impacts across safety, healthcare, environmental, and security sectors.



Figure 3: Group photo of the speakers and the participants