IET Travel Award for International Travel Report

Delegate: Xinyun Liu, University of Manchester

Conference: The 2023 48th International Conference on Infrared, Millimeter and Terahertz Waves (IRMMW-THz 2023)

Presentation title: Surface Oxidisation Layer Identification of Indium Nitride Nanoparticles via s-SNOM

Last week I had the amazing opportunity to attend the 2023 48th International Conference on Infrared, Millimeter and Terahertz Waves (IRMMW-THz 2023) in Montreal, Canada, all thanks to the financial support from IET travel grant.

As the biggest conference in microwave to infrared wave frequency, the conference offers a platform to explore the latest advancements and research trends in the field of infrared, millimeter, and terahertz waves' sources, devices, applications. By attending presentations, workshops, and discussions, I expanded my knowledge base and stay up-to-date with cutting-edge research. Moreover, delivered an oral presentation at such a prestigious conference like this provided a chance to showcase my work to a knowledgeable and engaged audience (Figure 1). This experience enhances my presentation skills, boosts my confidence, and attracts recognition for my research. Last but not least, I have received valuable feedback and engaged in discussions with experts in my field. This feedback provided new perspectives, insights, and suggestions for further improvements, thereby enhancing the quality and impact of my research.

Figure 1. The photo of delegate giving oral presentation at IRMMW-THz 2023.

My main purpose of this academic trip is to give a presentation on my research work, utilizing scattering type - scanning near field optical microscopy (s-SNOM) on Indium Nitride (InN) nanoparticles. The s-SNOM is a powerful technique for surface analysis, allowing imaging and spectroscopy on nanometre length scale. The s-SNOM is atomic force microscope (AFM) based instrument, where a light source is coupled to the apex of a sub-wavelength (nanoscale) metallic tip (Figure 2). The light experiences strong field confinement, generating an evanescent (near-field) at the tip apex that interacts with the sample. Then the light scatters back in the far-field to detector carrying the near field sample information. In our experiments, s-SNOM is conducted in tapping-mode, with the tip oscillating at a set frequency **Ω**. The near field signal is then modulated at harmonic orders of the tip-tapping frequency n**Ω**. As the background signal remains unmodulated, the near-field signal can be separated from large background noise, providing local sample information. Due to the near-field exponential decay nature, s-SNOM is a perfect tool for surface analysis, as the probing depth can be tune down to 10s of nanometres from the surface. In my project, I employed s-SNOM technique to identify the surface state of InN. Our data shows that the surface of InN nanoparticles is having response related to carbon bonds. Furthermore, when we changed the probing volume, the stronger response appears with smaller probing volume, suggesting this carbon content is more pronounced on the surface.

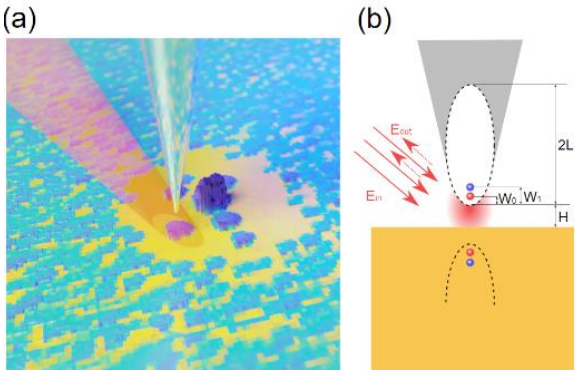

Figure 2. (a) 3D simulated diagram and (b) Schematic diagram of tip-sample interaction inside s-SNOM.

This conference is not only about academic skills, but also about people skills. It brings together experts, researchers, and professionals from academia, industry, and government sectors. During and after every day's conference programme, I networked with peers and professionals in my research field over coffee and dinner (Figure 3). For examples, I discussed with other peer PhD students from different institutes on latest updates in our field and tips on data processing. Also, I liaised with a few academic principal investigators and industrial representatives who have opening job positions. All of those above establish valuable connections, and potentially collaborate on future projects or research endeavours.

Figure 3. The delegate sightseeing Montreal, Canada with peer PhD students.

The early career researchers (ECRs) and PhD students are often struggling on attending conferences or paying academic visits due to funding restrictions, regardless those activities would boost their research and future career. In this case, I feel really privileged to be able to travel to far away Canada through IET travel award. Here I would like to express my genuine gratitude to the IET who have been supporting ECRs on travel. I would also recommend peers in my institute to apply for IET travel award, as this would be a great chance to get support for networking and knowledge-exchanging.