

# When low-dimensional materials meet metasurfaces

**Cheng-Wei Qiu**

Department of Electrical and Computer Engineering, National University of Singapore, Singapore

\*E-mail: [chengwei.qiu@nus.edu.sg](mailto:chengwei.qiu@nus.edu.sg)

Metasurfaces and low-dimensional materials have been developing as important candidates in the interfacial engineering, providing a plethora of new possibilities in novel optoelectronic functions and applications. The synergies between those domains hold great promises in manipulating light-matter interaction. In this talk, I will start from reviewing and reporting some of the most recent developments in metasurfaces and nanophotonics, and then focus on how monolayer TMDC and layered 2D materials could be hybridized with classic metasurfaces to modulate and structure novel light behavior, such as zero-dark-current and bipolar semimetal photodetector, monolayer meta-lens of atomic thickness, hybrid designs with enhanced SHG, PL, and tunable structural colors, by the coordinated hybridization between those two parties. Finally, we will elaborate our new breakthrough based on the fusion and integration of symmetry and topological physics with van der Waals polaritonic metasurfaces, as a new roadmap toward ultra-low loss, long-range propagation, topological interfaces, and tailorable on-chip integrated functional devices.



**Biography:** Prof. Cheng-Wei Qiu is appointed Dean's Chair Professor in College of Design and Engineering, NUS. He was Fellow of APS, Optica, SPIE and The Electromagnetics Academy, US. He was the recipient of President's Science Award 2023, the highest science accolade in Singapore. He was elected Fellow of ASEAN Academy of Engineering and Technology. He is well known for his research in structured light and interfaces. He has published over 480 peer-reviewed journal papers. He was the recipient of URSI Young Scientist Award in 2008, NUS Young Investigator Award in 2011, MIT TR35@Singapore Award in 2012, Young Scientist Award by Singapore National Academy of Science in 2013, Faculty Young Research Award in NUS 2013, SPIE Rising Researcher Award 2018, and Engineering Researcher Award 2021 in NUS, and World Scientific Medal 2021 by Institute of Physics, Singapore, Achievement in Asia Award (Robert T. Poe Prize) by International Organization of Chinese Physicists and Astronomers in 2022. He was Highly Cited Researchers in 2019, 2020, 2021, 2022, 2023 by Web of Science. He has been serving in Associate Editor for various journals such as JOSA B, Photonix, Photonics Research, and Editor-in-Chief for eLight. He also serves in Editorial Advisory Board for Laser and Photonics Review, Advanced Optical Materials, and ACS Photonics.