**Control of polaritons in low-dimensional nanomaterials**

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Polaritons are well-established carriers of light, electrical signals, and even heat at the nanoscale. Achieving control over it is pivotal for the realization of nanoscale manipulation of light signals and even heat within on-chip devices. Our research explores efficient excitation of polaritons in one-dimensional to two-dimensional nanomaterials, leading to the discovery of polariton modes with ultra-high optical-field confinement and quality factors. Through the ingenious design of dielectric environments, we have successfully mitigated the transmission losses of polaritons, enabling long-distance propagation. Furthermore, by employing techniques such as heterostructures, chemical doping, and electrical modulation, we have achieved precise control over the transmission modes and directions of polaritons. These research findings address the challenge of efficient optoelectronic modulation beyond the diffraction limit, offering a novel pathway for the development of highly integrated optoelectronic interconnect chips.

**Short Bio:**

**Qing Dai** received his PhD degree from University of Cambridge, UK. He is a professor of National Center for Nanoscience and Technology, China. His research team pioneered and successfully validated the academic concept of using polaritons as on-chip optoelectronic interconnects, providing new insights for developing next-generation high-performance photonic chips and precision detection instruments. Over the past five years, he has published over 80 academic papers as the corresponding author in high-profile journals such as Science (2), Nature (1), Nature Materials (2), and Nature Nanotechnology (3). He has been elected as a Fellow of the Optical Society of America, a Fellow of the Royal Society of Chemistry in the United Kingdom, and a Young Affiliate of The World Academy of Sciences (TWAS). Currently, he serves as an associate editor, editorial board member, or advisory board member for domestic and international academic journals including Advanced Optical Materials, Fundamental Research, Nanoscale, Nanoscale Advances, and Nano Today.