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## Twisted Nano-Optics: steering the nanolight at will

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Polaritonics, a rapidly evolving field, offers a profound understanding of light-matter interactions and opens the gateway to nanometric scales previously inaccessible due to the diffraction limit of light. Here, we present a route for the manipulation of nanoscale-confined polaritons, specifically their dispersion, propagation, and optical losses etc. With the help of state-of-the-art infrared nano-imaging technique, we demonstrate that polaritons in anisotropic van der Waals materials exhibit exotic optical phenomena at the nanoscale (e.g. anomalous refraction, negative reflection, complex interference etc.) and unique properties (e.g. highly collimated propagation, enhanced photonic density of states, indefinite dispersion etc.). By stacking and twisting these materials, we enable the diffraction-free guiding and nano-focusing of mid-infrared light at the nanoscale. We also design tunable polaritonic nanoantennas with ultra-narrow resonances, which could find applications in active nanooptics and (bio)-sensing.

### **Short Bio:**



**Jiahua Duan** received his PhD degree in Institute of Physics, Chinese Academy of Sciences, China. He is a professor of Beijing Institute of Technology, China. His research focuses particularly on interactions between light and quantum materials at extreme limits and at the nanoscale, by employing a variety of innovative techniques, e.g., imaging methods that operate with visible and infrared light. He has published more than 40 peer-reviewed publications in high-profile journals, such as Nature Materials, Nature Reviews Physics, Nature Communications, Science Advances, Nano Letters, Advanced Materials etc. His work on twistoptics has been chosen as a finalist for the Falling Walls Science Breakthrough of the Year 2021 and 2023 Top 10 Social influence Events in China's Optical Community. His work has been highlighted by various media, including but not limited to Phys.org, EurekAlert, China Optics, MIT Technology Review etc. He is a referee for Nature, Nature Materials, Nature Communications, Physical

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Review Letters, Science Advances etc.