Nanofabrication and optoelectronic navigation of nano-kirigami microrotors

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On-chip and freely reconfigurable manipulation of light at nanoscale is one of the most important challenges faced by urgent applications such as photonic integration, metasurfaces and optical metamaterials. With the rapid development of micro/nano-fabrication technologies, the realization and reconfiguration of transformable nanostructures has aroused great interests in the areas of electronics, mechanics, advanced manufacturing, energy harvesting, and biomedical engineering. However, most deformable structures and devices at micro-/nanoscale are typically fabricated or transformed at fixed positions and restricted to limited mechanical motion along a single axis due to their small sizes, which significantly limits their functionalities and applications. In this talk, we report the precise nanofabrication and free navigation of nano-kirigami microrotors. Metallic rotors with size of ~10 □m are deliberately fabricated and released from the substrates, where are readily manipulated with controllable speed and direction using an advanced optoelectronic tweezers technique. This work provides a novel methodology to fabricate and manipulate micro-/nano-rotors with well-designed and sophisticated kirigami morphologies, providing new solutions for future advanced micro-/nanophotonic devices and optoelectronic micro/nano-machinery.

Short Bio:

Prof. Jiafang Li graduated from Nankai University in 2005 and obtained his PhD degree in 2009 from Swinburne University of Technology, Australia. He

worked at Institute of Physics, Chinese Academy of Sciences from 2009 to 2018, visited MIT as a visiting scholar in 2017, and took the Professorship at Beijing Institute of Technology in 2018. His research activities are focused on 3D micro-/nanofabrication and nanophotonics, especially on the development of the innovative 3D nano-kirigami nanofabrication technique, the creative reconfiguration methodology for Nano-Opto-Electro-Mechanical Systems (NOEMS), and the exceptional manipulation capability of nano-kirigami microrotors with optoelectronic tweezers. Prof. Li has published more than 100 peer reviewed papers, including Sci. Adv., Nat. Commun., Light, Adv. Mater., Nano Lett., etc. He was elected as National Top Young Talents in 2020 and awarded the National Funds for Distinguished Young Scientists in 2023.