Contribution ID: **17** Type: **Oral Talk 口头报告**

# Phase engineering of giant second harmonic generation in Bi2O2Se

Two-dimensional (2D) materials with remarkable second-harmonic generation (SHG) hold great promise for future on-chip nonlinear optics. Nevertheless, relevant materials possessing both scalable SHG response and environmental stability are rare. Here, we demonstrate the enormous SHG resulting from the phase engineering of a high-performance semiconductor, $Bi_2O_2Se$ (BOS), under uniaxial strain. SHG signals captured in strained 20 nm-BOS films exceed those of $NbOI_2$ and $NbOCl_2$ of similar thickness by a factor of 10, and are four orders of magnitude higher than monolayer-$MoS_2$. Intriguingly, the strain enables continuous adjustment of the ferroelectric phase transition of BOS near room temperature (RT). As a consequence, an exceptionally large tunability of SHG, approximately six orders of magnitude, is achieved through strain or thermal modulation at RT. This colossal SHG, originating from the geometric phase of Bloch wave functions and coupled with highly sensitive tunability through multiple approaches at RT in an air-stable 2D semiconductor, opens up new possibilities for designing advanced chip-scale, switchable nonlinear optical devices.

Reference:

Z. Lou, Y. Zhao, Z. Gong, Z. Zhu, M. Wu, T. Wang, J. Wang, H. Qi, H. Zuo, Z. Xu, J. Shen, Z. Wang, L. Li, S. Xu, W. Kong, W. Li, X. Zheng, H. Wang, X. Lin, Phase Engineering of Giant Second Harmonic Generation in Bi2O2Se. Adv. Mater. 2024, 2409887.

**Primary authors:** Prof. LIN, Xiao (Westlake University); Mr LOU, Zhefeng (Westlake University)

**Co-authors:** Ms QI, Haoyu (Yangtze Delta Region Academy of Beijing Institute of Technology); Mr ZUO, Huakun (Huazhong University of Science and Technology); Dr WANG, Jialu (Hangzhou Normal University); Mr SHEN, Jichuang (Westlake University); Prof. LI, Lan (Westlake University); Ms WU, Mengqi (Westlake University); Prof. XU, Shuigang (Westlake University); Mr WANG, Tao (Westlake University); Prof. KONG, Wei (Westlake University); Prof. WANG, Zhiwei (Beijing Institute of Technology); Mr XU, Zhuokai (Westlake University); Mr ZHU, Ziye (Westlake University); Prof. WANG, Hua (Zhejiang University); Prof. LI, Wenbin (Westlake University); Prof. ZHENG, Xiaorui (Westlake University); Mr ZHAO, YingJie (Westlake University); Mr GONG, Zhihao (Tianjin Normal University)

**Presenter:** Mr LOU, Zhefeng (Westlake University)