

# SHG studies on surface states of 3D topological insulators and TMDCs

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The scope of nonlinear optics has expanded rapidly in recent decades, and found applications and new phenomena in emerging materials of low dimensionalities. During the past few years, we have been exploring the utility of nonlinear optics in characterizing two-dimensional systems, such as surface states of 3D topological materials (TIs) and transition metal dichalcogenides (TMDCs). We investigated the nature of SHG response from TI surface states, showing that it is both sensitive to the out-of-plane polar ordering at the interface, as well as the deviation from the parabolic band dispersion at the Fermi level. We also used the optical second harmonic generation to resolve the atomic structures of artificial bilayers and grain boundaries of TMDC materials, which helped to reveal the interplay between spin, layer, and valley pseudospins in related systems. [1-2]

## References

- [1] T. Jiang, H. Liu, D. Huang, S. Zhang, Y. Li, X. Gong\*, Y. R. Shen, Wei-Tao Liu\*, and S. Wu\*, *Nature Nanotech.* **9**, 825 (2014).
- [2] Hui Shi, Yu Zhang, Mengyu Yao, Fuhao Ji, Dong Qian, Shan Qiao, Y. R. Shen, and Wei-Tao Liu, *PRB*, **94**, 205307 (2016).