Ultrafast femtosecond lasers exposure to solids: time- and angle-resolved photoemission spectroscopy and it application on 2D materials

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Abstract

Angle-resolved photoemission spectroscopy (ARPES) is a powerful tool of probing electronic structures in solids, however static ARPES fails to visualize ultrafast dynamic processes and interactions, which contain rich physical information, for example, light-matter interaction and electron coupling with various coherent collective modes, which survive in few picoseconds or even tens of femtoseconds. To directly study such interesting phenomena, it is critical to develop time-resolved ARPES (TR-ARPES), by implementing ultrafast pump-probe laser beams: a first low energy infrared (IR) pulse as pump to stimulate/drive the system, and then a second high energy ultraviolet (UV) or extreme ultraviolet (XUV) pulse as probe to detect transient electronic states from femtosecond to picosecond time-scales.

Here I will first briefly introduce the development of a high resolution TR-ARPES. Then I will give its application on 2D materials, including ultrafast snapshots of nonequilibrium electronic structures in 1T-TaS2 and insulator-metal transition in a charge-density-wave material K0.3MoO3.

References

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Figures