Tracking topological signatures by time- and angle-resolved photoemission spectroscopy

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The impressive progress in high-resolution and multi-dimensional angle-resolved photoemission (ARPES) allows insights into the nature of the quantum states in the solid itself. We will discuss how topological properties are manifest in circular dichroism in ARPES. Based on state-of-the-art calculations, we demonstrate how momentum-resolved Berry curvature can be mapped out for prototypical two-dimensional materials.
Furthermore, topological properties can be induced by tailored light. However, realizing the induced Floquet-Chern insulator state and tracing clear experimental manifestions has been a challenge. We tackle this gap between theory and experiment by employing microscopic nonequilibrium Green's functions (NEGF) calculations including realistic electron-electron and electron-phonon scattering. Combining our nonequilibrium calculations with an accurate one-step theory of photoemission allows us to establish a direct link between the build-up of the topological state and the dichroic pump-probe photoemission signal.

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