Assessing nontrivial topology in Weyl semimetals by dichroic photoemission

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Dichroic photoemission as a tool to identify topological materials and access initial state information By performing angle-resolved photoemission spectroscopy (ARPES) and state-of-the-art SPR-KKR photoemission calculations on the paradigmatic Weyl semimetals Ta(As,P) [1] we show the spectroscopic manifestation of topological features and Weyl physics beyond the simple photointensity over a broad range of excitation energies from the vacuum ultraviolet to the soft X-Ray regime and compare the surface to the bulk band structure [2]. We further show the drawbacks of the existing spectroscopic techniques used to determine whether the given material has non-zero Chern number and discuss an improved approach for identifying Fermi arcs using differential ARPES measurements, their relation to orbital angular momentum (OAM) as well as the proper final state description. Consequently, a more realistic description of the final state is needed to explain dichroism by modeling the photoemission matrix element.

Keywords: photoemission, ARPES, Topology, Weyl, SPR-KKR

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