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Electronic structures and evolution in a transition metal pnictide Weyl semimetal family YULIN CHEN, Oxford University — Topological Weyl semimetals (TWSs) represent a novel state of quantum matter which not only possesses Weyl fermions (massless chiral particles that can be viewed as magnetic monopoles in momentum space) in the bulk and unique Fermi arcs generated by topological surface states, but also exhibits appealing physical properties such as extremely large magnetoresistance and ultra-high carrier mobility. By performing angle-resolved photoemission spectroscopy (ARPES) on compounds from a transition metal pnictide family (NbP, TaP and TaAs), we systematically investigated their electronic structures and discovered the unique surface "Fermi-arcs" and linear bulk band dispersion across the Weyl points. Furthermore, we also illustrated their Fermiology evolution with the spin–orbit coupling (SOC) strength. Our experimental findings not only reveal the mechanism to realize and fine-tune the electronic structures of TWSs, but also provide a rich material base for exploring many exotic physical phenomena (for example, chiral magnetic effects, negative magnetoresistance, and the quantum anomalous Hall effect) and novel future applications.

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