

## ARPES observation of topological Lifshitz transition in Weyl semimetal NbP decorated with Pb

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Since Weyl fermions, theoretically predicted massless particles, manifested themselves as the bulk quasiparticle excitations in transition metal monpnictides, e.g. NbP or TaAs, such materials, referred to as Weyl semimetals (WSM), have become a playground for testing some concepts of quantum field theory but also may find applications in very fast electronics and quantum computing. Then, an idea of introducing superconductivity in WSMs by the proximity effect at the superconductor/WSM interface has been developed<sup>1</sup>. It was predicted that such system can support the zero-energy modes that are equivalent to Majorana fermions, which have potential for realization of fault-tolerant topological quantum computation<sup>2</sup>.

Therefore, we applied the ARPES technique to study the early stages of formation of the Pb/NbP interface, a candidate for a superconductor/WSM system<sup>3</sup>. The experiments were carried out with use of the UARPES beamline at the National Synchrotron Centre SOLARIS in Krakow, Poland. ARPES spectra were taken for the (001) and (00 $\bar{1}$ ) surfaces (freshly cleaved *in situ* under ultra-high vacuum conditions). The samples were kept at the temperature of 80 K. The crystallographic orientation of the cleaved surface was assessed in a separate XRD experiment.

Deposition of 1 ML Pb on the P-terminated NbP face caused a substantial change in the Fermi surface pattern of the electronic surface states. It affected both topologically trivial and non-trivial ones. Topologically trivial states were suppressed due to dangling bond saturation. Topologically non-trivial surface Fermi arcs exhibited essential shape evolution and got tied to different pairs of Weyl point. So, we induced a topological Lifshitz transition of the surface Fermi arcs, while the positions of the Weyl points remained unaffected, as imposed by the bulk band structure topology. Nevertheless, the P-terminated NbP face decorated with Pb retained its characteristics necessary to create a superconductor/WSM interface on it. Similar Pb decoration of the Nb-terminated NbP face led to a change in the topologically trivial surface states but no modification of the surface Fermi arcs was detected.

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