Superconductivity and charge density waves in $LaTSb_2$ (T=Ag, Cu) Nodal Line Semimetals

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We investigated the electronic structure of $LaAgSb_2$ [1] and $LaCuSb_2$ systems, which exhibit charge density wave (below T_{CDW} = 207 K) and superconductivity (below T_c~1K) ground states, respectively. Moreover, the existence of topologically non-trivial nodal line states is predicted theoretically for both systems [2,3]. The presence of superconductivity in a topologically non-trivial material makes the second system particularly interesting.

The samples have been investigated with high-resolution angle-resolved photoemission spectroscopy (ARPES) technique using synchrotron radiation at uARPES beamline at National Synchrotron Radiation Centre Solaris in Kraków, Poland. Density functional theory (DFT) calculations have been performed to interpret the experimental data. Dirac state like dispersions have been identified in both the experiment and the theory with a reasonable mutual agreement. The differences in the shape of the Fermi surface of both compounds point to a breaking of the nesting at the transition from the CDW phase to the superconducting phase. A comparison of experimental data with slab calculations enabled the finding of surface states in ARPES spectra. Finally, the DFT results indicate that other than a phonon mechanism is responsible for CDW formation, as soft phonon modes are absent.

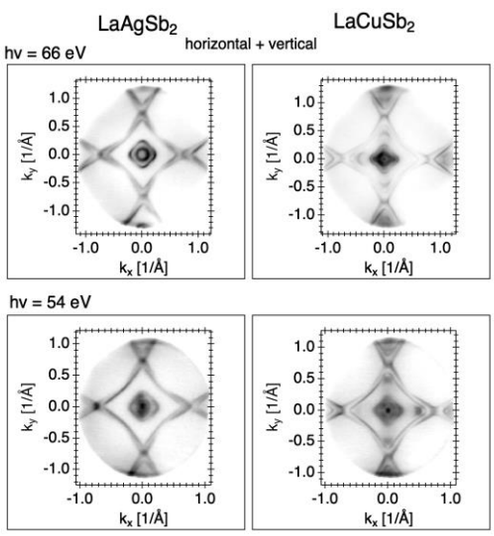

Figure 1. Fermi surfaces of $LaAgSb_2$ and $LaCuSb_2$ measured with photon energy equal to 66 eV and 54 eV.

References

1. M. Rosmus, N. Olszowska, Z. Bukowski, P. Starowicz, P. Piekarz, A. Ptok, arXiv:2204.12961
2. K. Wang, C. Petrovic, Phys. Rev. B **86** (2012), 155213
3. P. Ruszała, M. J.Winiarski, M. Samsel-Czekała, Comput. Mater. Sci. **154** (2018), 106-110