

Photoemission spectroscopy studies on high- T_c superconductors and topological materials

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Abstract

Photoemission Spectroscopy (PES) is a powerful technique in directly probing the electronic structure of solids especially in its angle-resolved mode (ARPES) [1]. For this purpose, synchrotron radiation as well as high-resolution lasers and other light sources have been used [2]. In this talk, I will present how we have been implementing this technique to uncover various aspects of the electronic structure of quantum materials, in particular the iron-pnictide high- T_c superconductors from the early stage since their discovery in Japan in 2008 [3]. The discussion will include the core energy levels [4], the three-dimensional electronic structure [5], the Fermi surfaces and superconducting gaps [6], the coupling to bosonic modes [7,8], etc. I will also present our recent work on α -Sn which has recently gained much attention due to the diverse tunable topological phases it can reveal ranging from a topological insulator (TI) to a topological Dirac semimetal (TDS) depending on the applied strain in addition to its simple elemental structure, non-toxic nature and great potential for applications [9]. Finally, I will make a brief overview on the recent research projects we have launched at LAU.

References

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Short Bio

Walid G. Malaeb is an Assistant Professor of Physics at The Lebanese American University – LAU. He obtained a PhD in Physics from the Graduate School of Frontier Sciences at The University of Tokyo in 2009, and stayed at the same university as a project researcher at the Institute for Solid State Physics (ISSP) until 2015. His research interests focus on investigating the electronic structure of novel materials like high-temperature superconductors and topological materials mainly using ARPES & XPS. He has also interest in studying nanomaterials. Currently he has several national and international collaborative research projects especially with Japan.