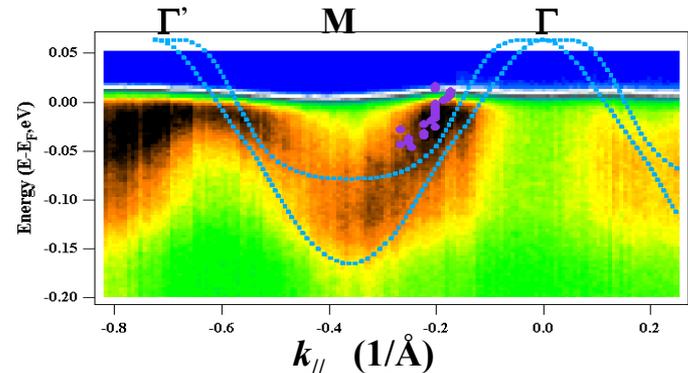


Electronic Structure of Electron Doped Fullerene

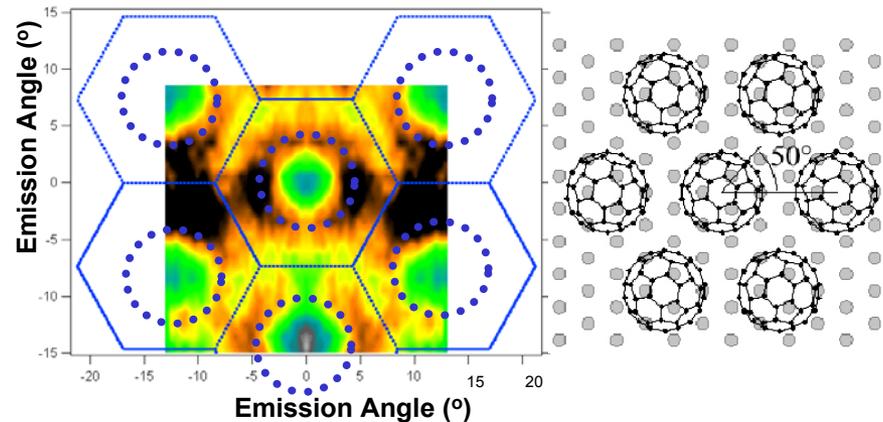
Zhi-Xun Shen, Stanford University, DMR-0071897

The electronic structure of the delocalized electrons, which is characterized by the *conduction bands*, in solid state plays the most important and fundamental role to explain or predict novel properties.

Electron doped C_{60} system exhibits interesting properties, e.g. superconductivity, is a key model system of molecular solid exhibiting interesting correlation physics. Although of fundamental importance, the detection of band structure remained elusive after a decade of intensive effort. This work reveals the band structure and Fermi surface of electron doped C_{60} thin films prepared on metal substrates by using angle resolved photoelectron spectroscopy (ARPES). This breakthrough was made possible by significantly improved momentum resolution.



Conduction *band dispersion* of C_{60} monolayer on Ag substrate and doped by three electrons.



Fermi surface and real-space molecular arrangement of C_{60} on Ag(111)

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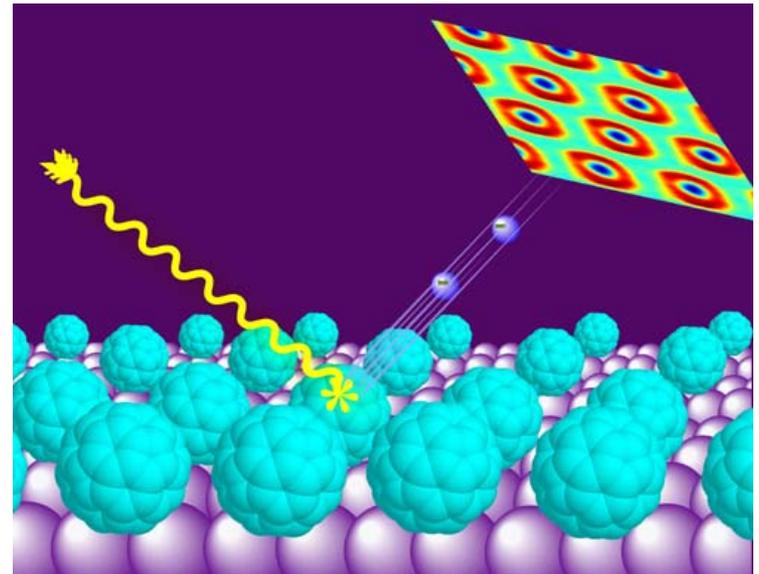
Education and Contribution:

Two summer undergraduate students, one graduate student and two postdocs (partial support).

Outreach:

As a *nano*-scale molecule, C_{60} is a material with a great potential for applications, e.g. pharmacy, catalysts, and photosensitive materials.

Data emerged in our work suggest that C_{60} is a great model system to understand the electronic properties of molecular solids, and has potential for certain electronic applications. Further investigation has revealed the extremely strong dependence of electronic structures on the molecular orientation, a finding of general interest beyond solid state physics, for example in protein folding.



ARPES probes electronic structure of organic metals. This work demonstrates the special capability of ARPES on nano-material science.