Condensed Matter Physics Seminar Series

Probing quantum phase transitions in molecular crystals and topological Dirac semimetals through Angle Resolved Photoemission Spectroscopy ARPES

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ARPES is a useful tool to study a variety of phenomena in quantum materials, as it directly probes the momentum-resolved electronic structure, revealing band dispersions, Fermi surface topology and electron self-energy in materials. In this talk, I will talk about two different systems studied through this technique. The first addresses a molecular thin crystal of C60, where in contrast to an expected single-molecule-dominated electronic structure, we find that long range interactions between the molecules have a profound effect shaping the electronic structure of this material. Additionally, we find that upon in-situ potassium (K) doping, the C60 thin film undergoes a Mott transition from a molecular insulator to a correlated metal, which challenges the commonly accepted band-filling picture as the explanation for the K3C60 metallicity. In the second part of the talk, I will show preliminary studies of type-II Dirac semimetals that present a ferromagnetic order upon magnetic element substitution. Our ARPES measurements on the parent topological Dirac semimetal PtTe2 show a clear signature of type-II fermions, in consistency with theoretical calculations. Upon Cr substitution, we observe the evolution of the electronic structure of this topological material, where signature of type-II excitations disappears but a metallic topological surface state endures the presence of a magnetic moment in the material.

Claudia Ojeda-Aristizabal is an Associate Professor at the Department of Physics and Astronomy at California State University Long Beach. Claudia is originally from Colombia where she completed her undergraduate studies at Universidad de Los Andes in 2004. She later obtained a master in condensed matter physics at the Ecole Normale Supérieure in Paris France in 2007 and a PhD in experimental condensed matter physics at the Laboratoire de Physique des Solides in Orsay in 2010, before holding postdoctoral appointments at the University of Maryland College Park and the University of California Berkeley. Her lab at Long Beach focuses on low dimensional materials where the interplay of electronic correlations, topology and crystal field effects leads to exciting ground states, probed through electronic transport measurements at low temperatures using her lab facilities at Cal State Long Beach and angle resolved photoemission spectroscopy experiments for which she travels with her students to the Advanced Light source at the Berkeley Lab.

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