

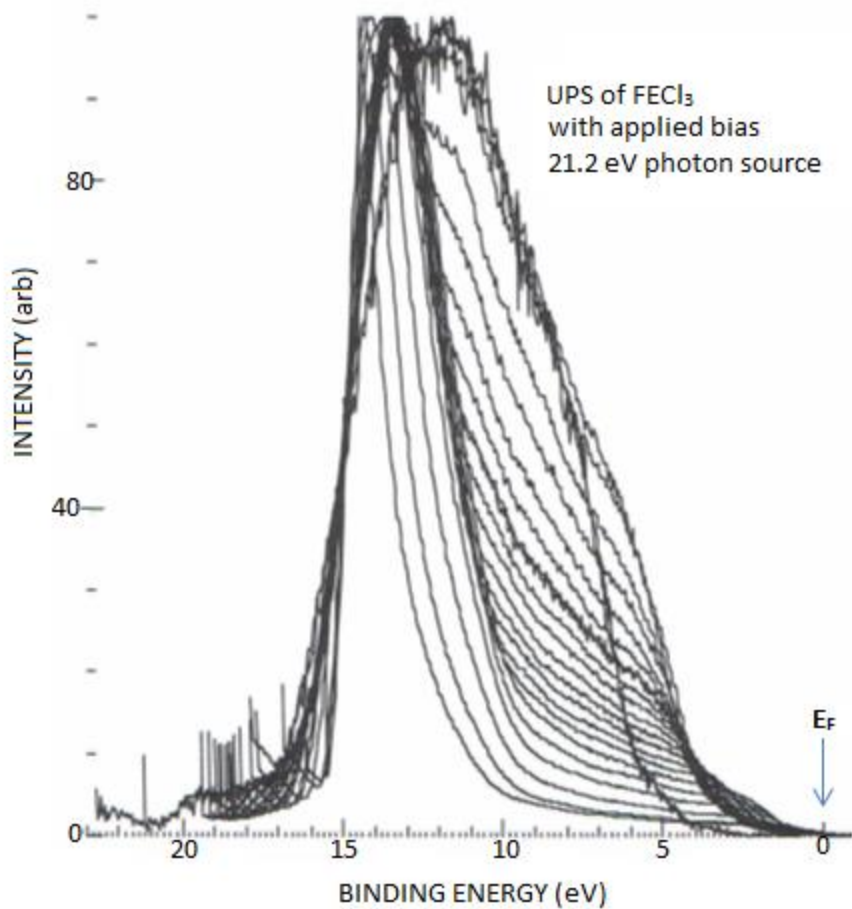
## **Modification of Density of States in Iron Chloride Intercalated Epitaxial Graphene with Electric Bias**

K. D. McAllister<sup>1</sup>, A. P. Sharma, K. Shepperd<sup>2</sup>, E. H. Conrad<sup>2</sup>, M.D. Williams<sup>1</sup>.

<sup>1</sup>Center of Excellence in Microelectronics and Photonics, Department of Physics, Clark Atlanta University, Atlanta, GA 30314.

<sup>2</sup>School of Physics, Georgia Institute of Technology, Atlanta GA 30332

Epitaxial semi-metallic graphene on the carbon face of silicon carbide has mixed phase AA and AB stacking orders. Iron chloride intercalated graphene and characterized, by contrast, with AA stacking order. The high electronegativity of the iron chloride spacing layers between the graphene bi-layer results in hole-doping of the graphene. Ultraviolet photoemission spectroscopy is used to investigate the electronic structure modifications of stage-1 and stage-3 iron chloride intercalated bi-layer graphene with the application of an external electric field normal to the surface. The dominant features of the study are the modification of the work function and the density of states with the applied electric field and staging order of the intercalant. In particular, the p-type carriers of the stage-1 system are switched to n-type behavior with increasing field strength in agreement with recent models.



Aligned UPS spectra of stage-1 sample biased from 0.0 to  $-10.00$  V. The peak in the secondary electron tail at the high binding energy edge of the electron distribution curves has a maximum intensity at  $-1.5$  V which indicates that the work function has a minimum at this bias voltage. The increasing kinetic energy of the valence band maximum at the low binding energy edge with increasing bias is indicative of the transition of p-type carrier character to n-type.

The effect of other stages of intercalation will also be explored.