Angle resolved photoemission and its contribution to our understanding of the high temperature superconductors

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Angle resolved photoemission has played a major role in the elucidation of the electronic structure of new materials. Its role has increased substantially with the advent of strongly correlated materials, since some techniques, such as de Haas-van Alphen resonance, cannot be applied to materials in which the electron mean-free-path is short. More importantly, materials with reduced dimensionality tend to have very anisotropic interactions, requiring momentum dependent information. At this, angle resolved photoemission joins scattering techniques as being some of the few techniques able to provide such information.

Although angle resolved photoemission can be carried out in the laboratory, originally with UV discharge lamps, and more recently with lasers, the synchrotron radiation source has been fundamental to its success for several reasons. The tunability of the source, the adjustable, variable polarization, and not least, the ultra high vacuum environment, have all contributed to the wealth of results.

After briefly introducing the technique of angle resolved photoemission, I will review some of the unique contributions that this technique has made to our understanding of the high temperature superconductors. Finally, I will present some new results, which show the unusual character of these materials.