High Energy X-ray Photoemission at Spring-8 BL29XU

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High Resolution and High Throughput Photoemission with Hard x-rays

- Merit

  Decrease of inelastic mean free path (IMFP)

  Large probing depth: Decrease surface sensitivity,

  Increase signal intensity,

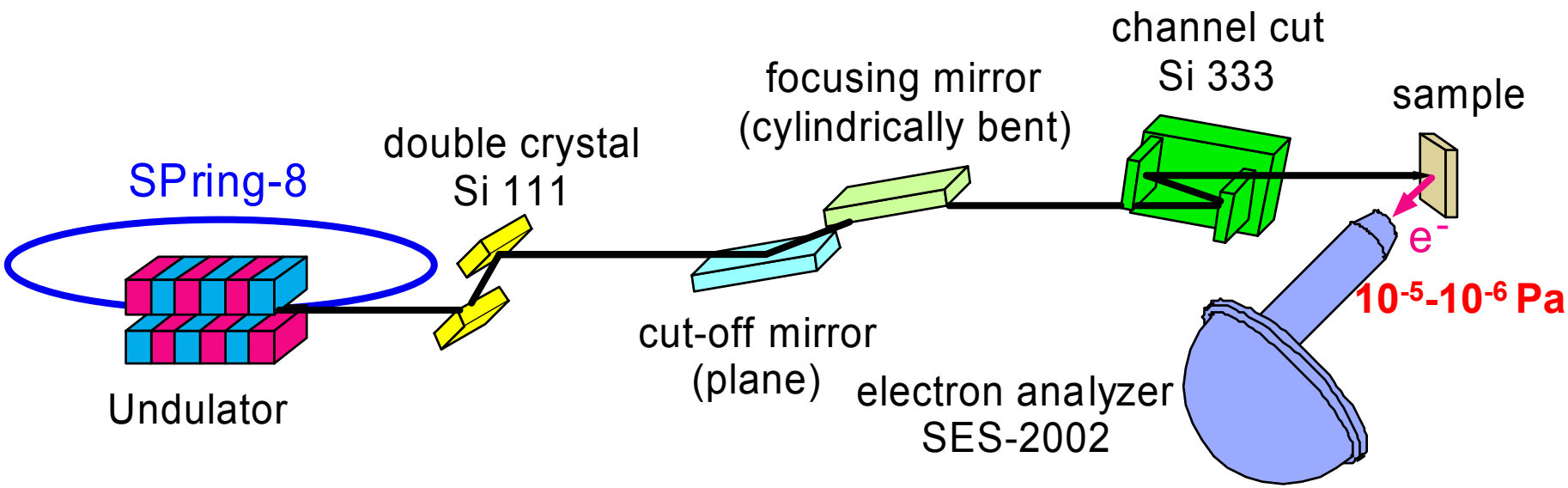
  High quality of spectra

- Demerit

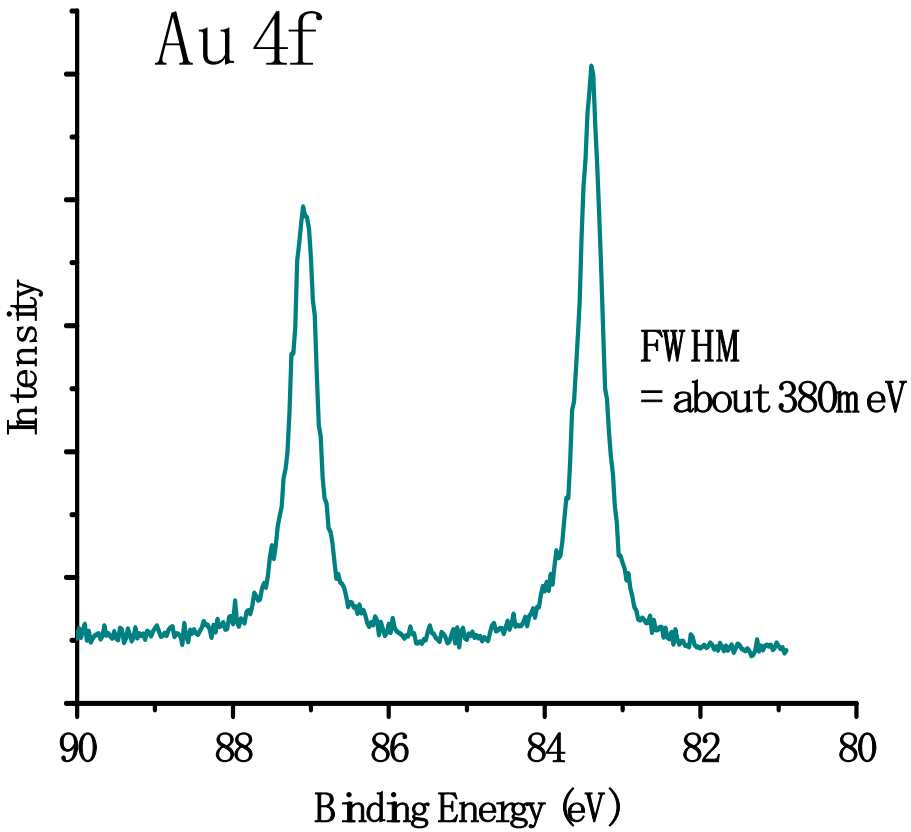
  Rapid decrease of photoionization cross sections with photon energy

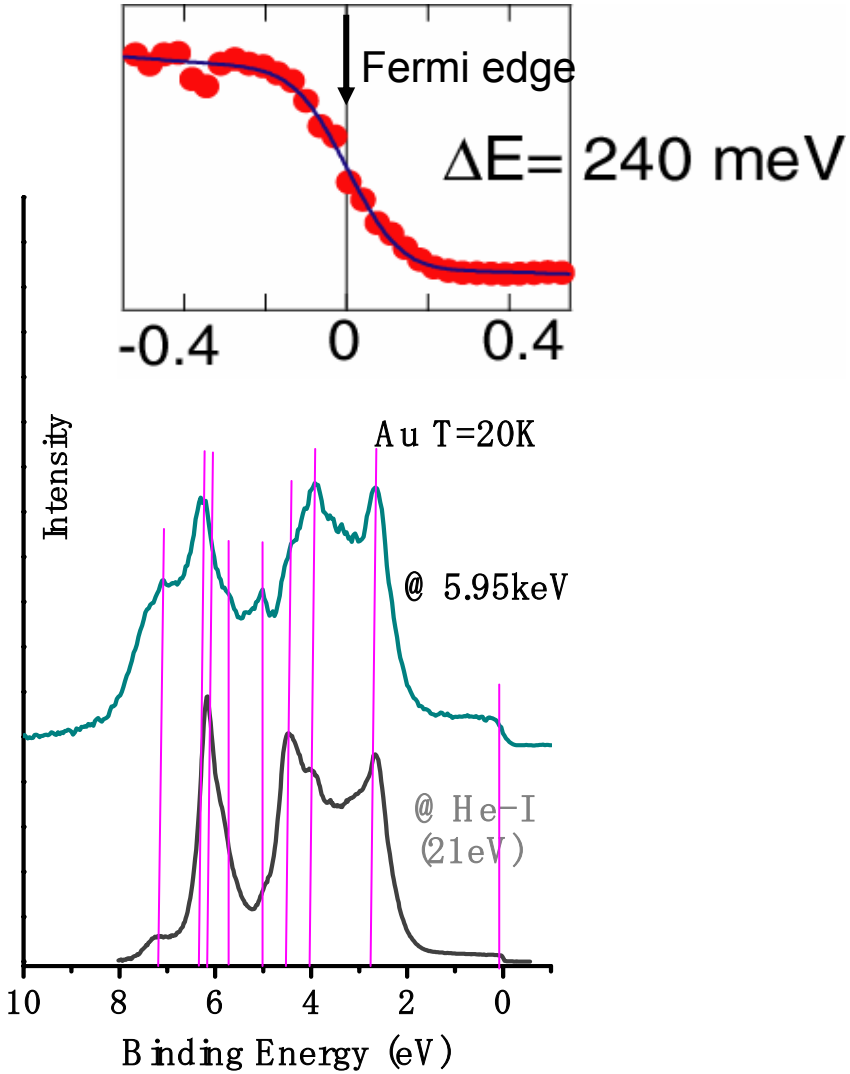
Exprerimental Setup at **BL29XU**

$2x10^{11}$ photons in 0.12 mm (vertical) ×0.7 mm focal spot

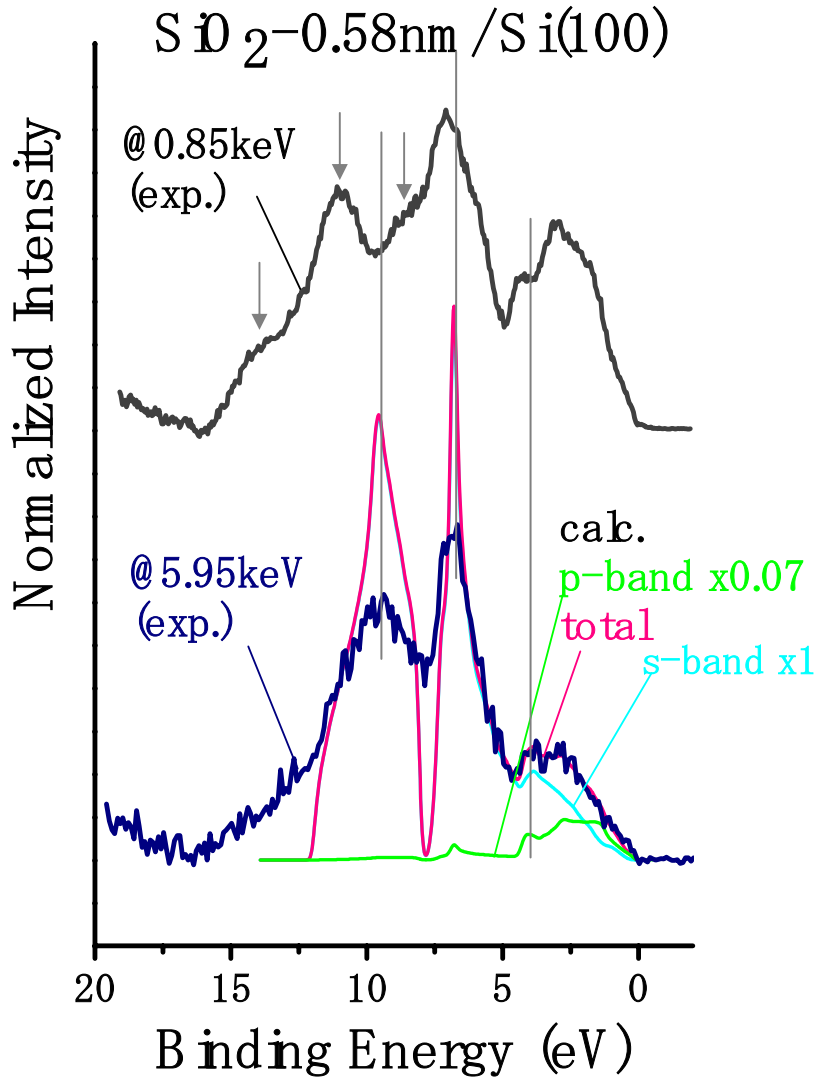


High Resolutin and High Throughput : Au 4f and Valence Band Spectra



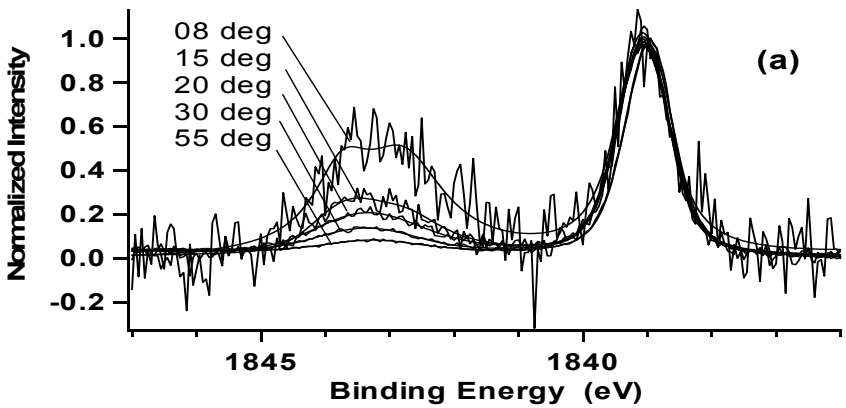


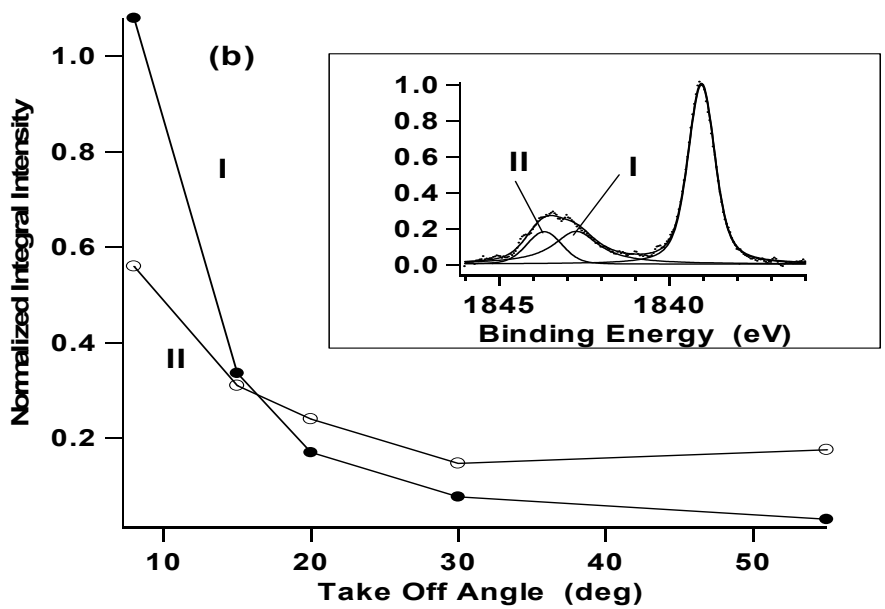
Surface Insensitivity: Si Valence Band

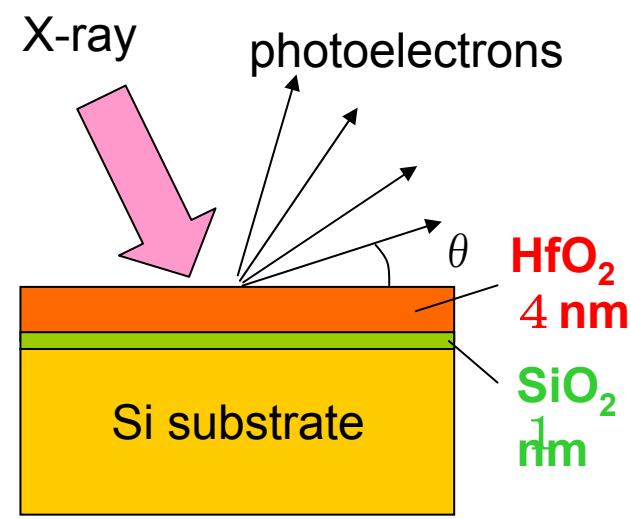


ESCA Application to Si-LSI Gate Dielectrics

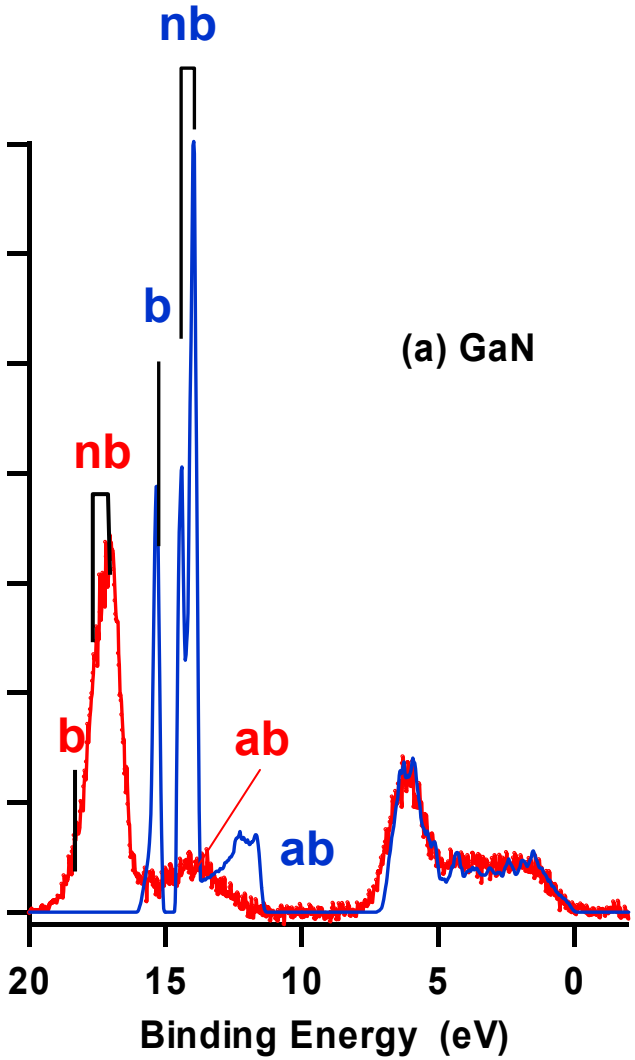
high-k dielectric interfaces: take off angle dependence

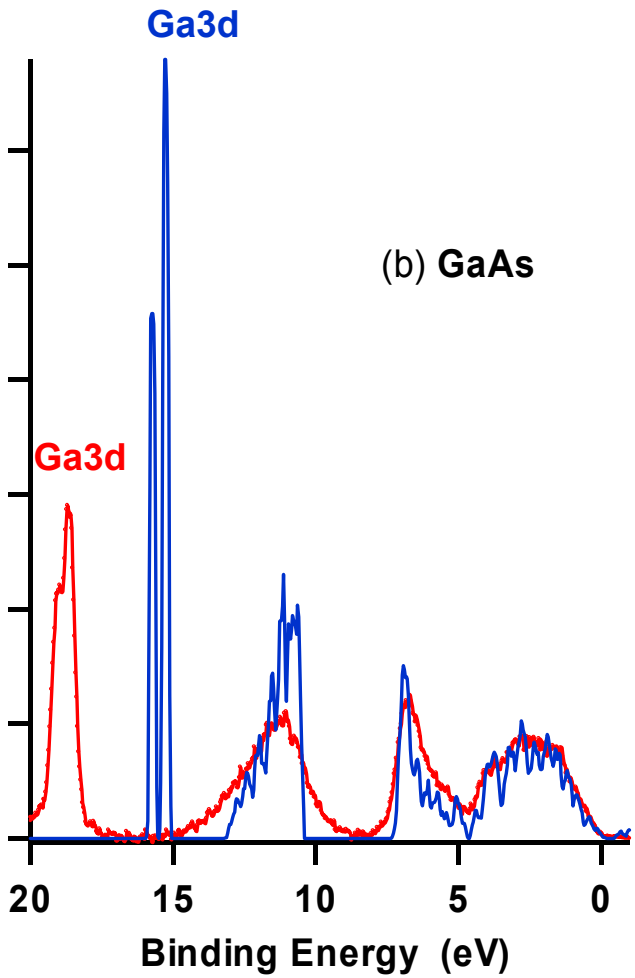




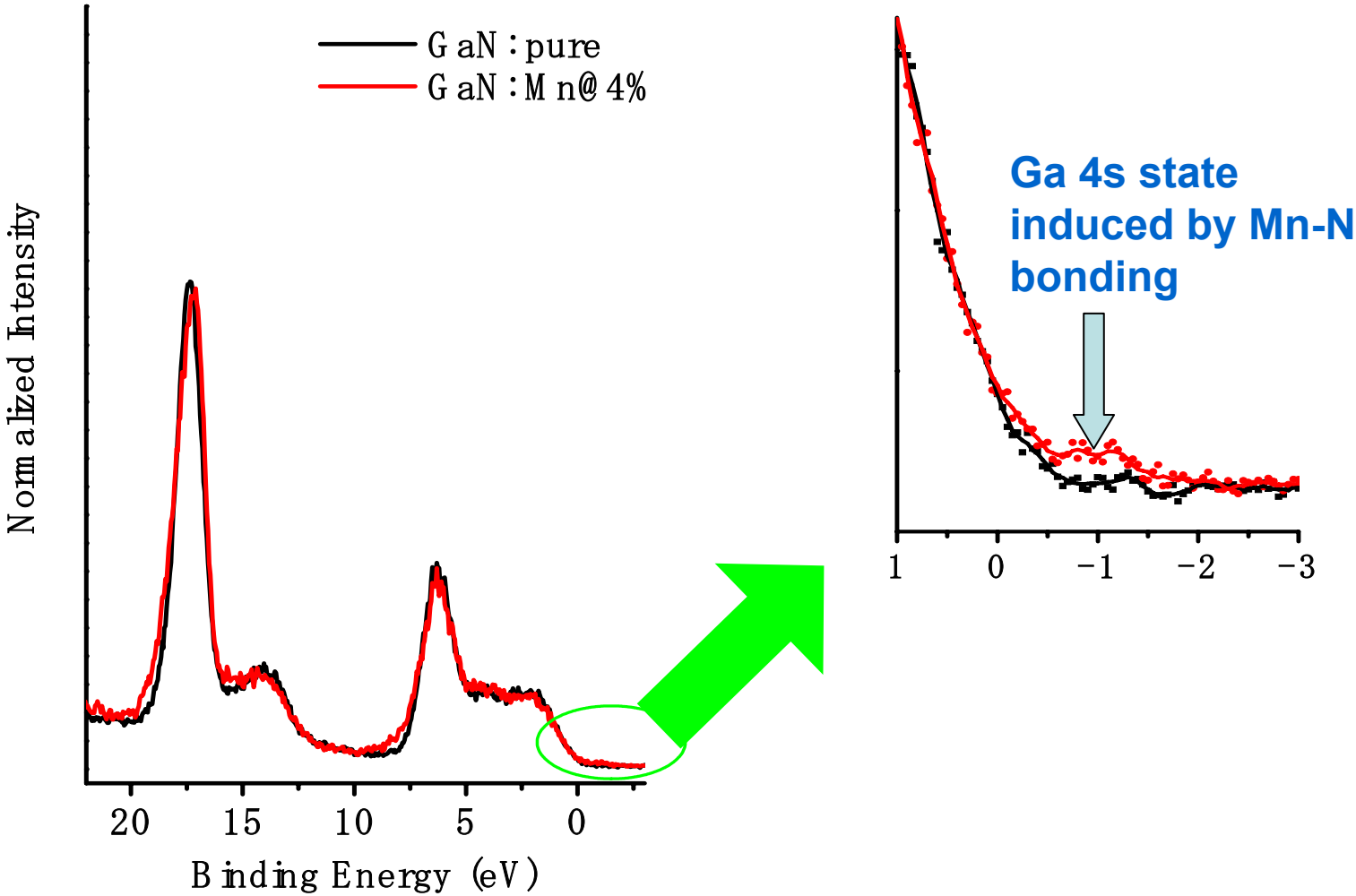


3d Core Hybridization Effect in Wide Gap Semiconductors GaN and GaAs

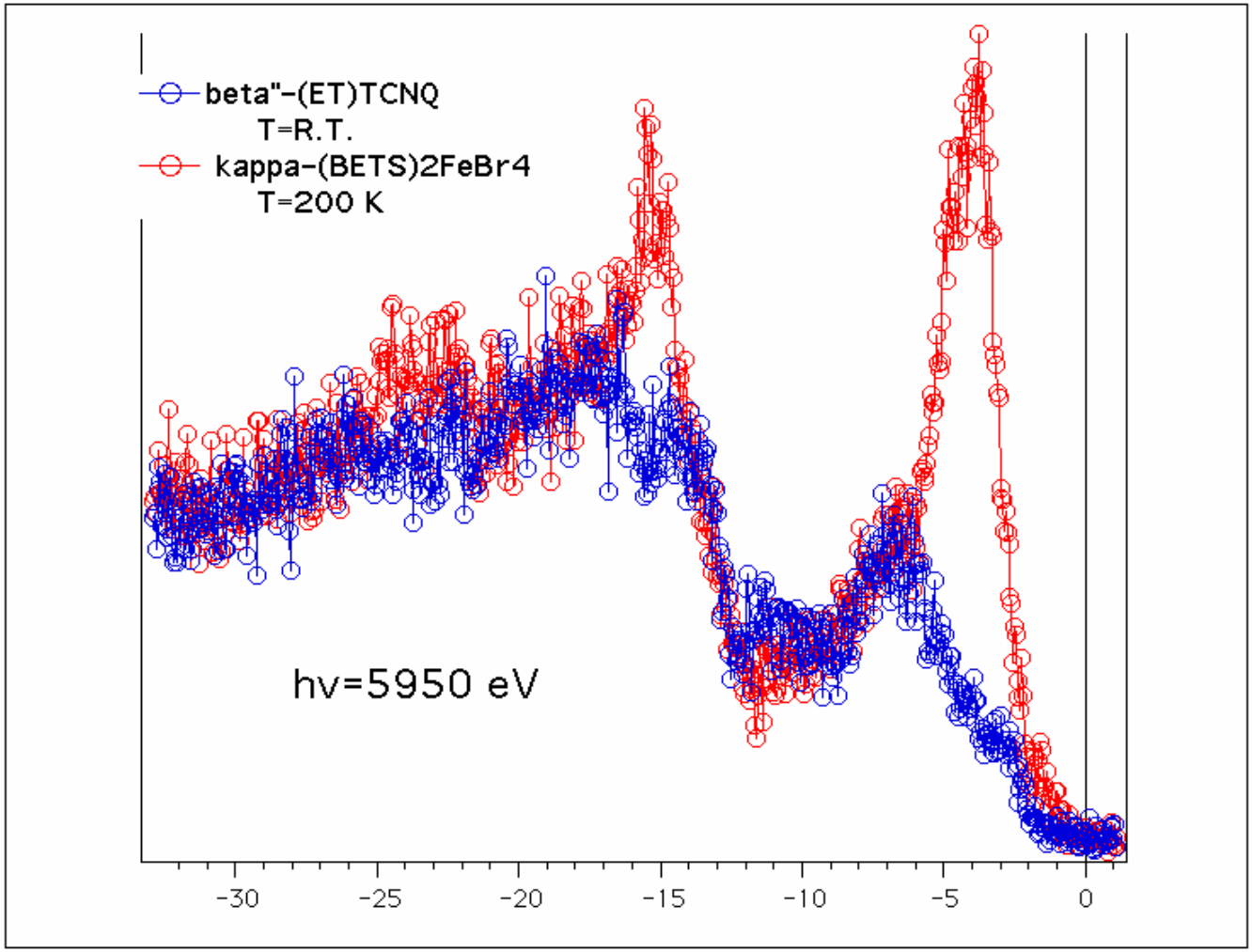




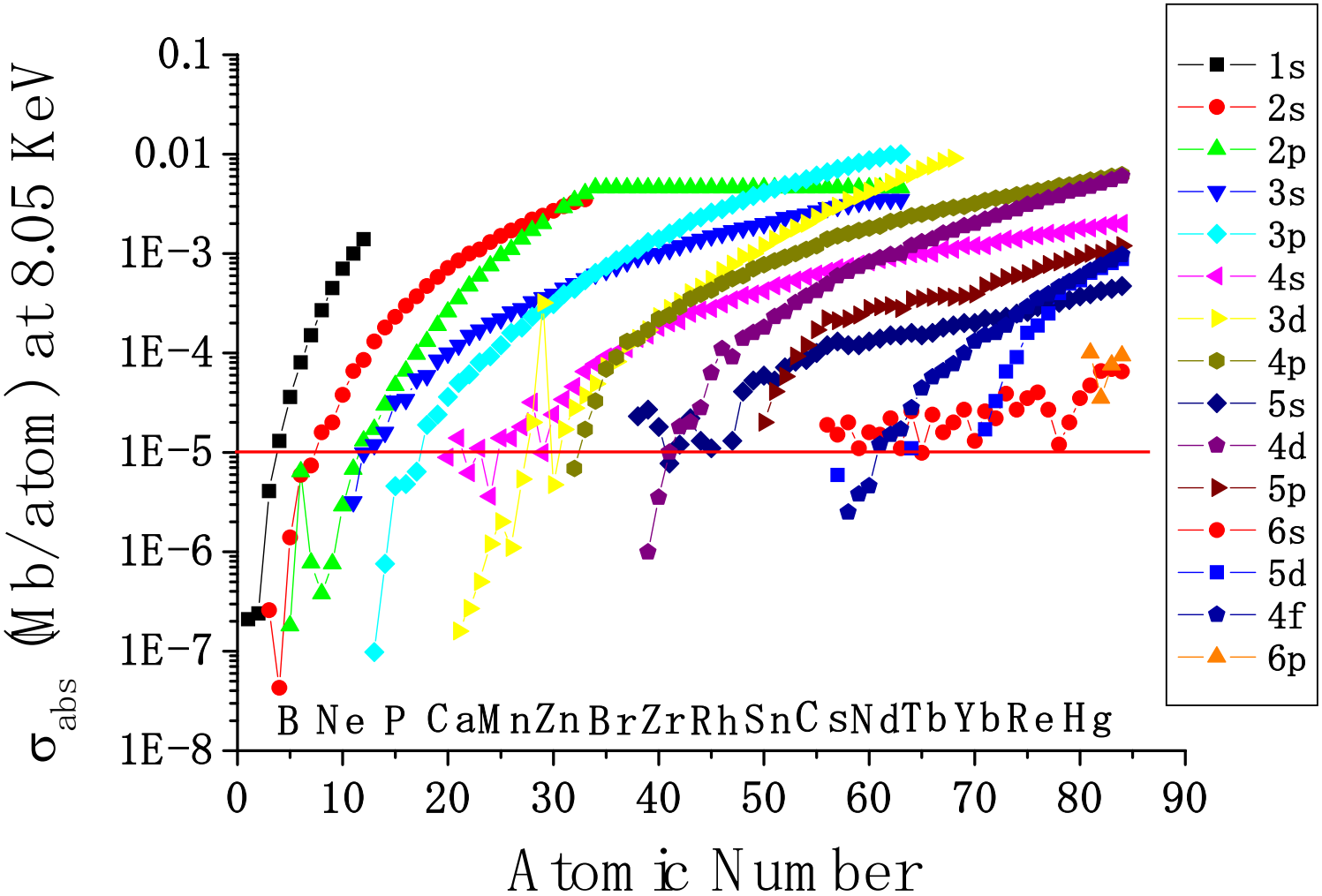
Band Gap State Induced by Mn Doping



VB spectra of Organic Compounds



Subshell Photoionization Cross Sections as functions of atomic number at 8 keV



Applications

1 . High precision PES

high energy resolution , high angle resolution, low temperature.

UHV condition is needed------low throughput

Solid state physics

2. High throughput PES

medium energy and angle resolution, high acceptance, non UHV.
Material research, Chemical analysis

Challenges

1. High angle resolution ARPES at 5-10 keV for band dispersion measurements

2. Non destructive depth profiling by large acceptance angle analyzer

3. Scanning photoelectron microscope with focused X-ray beam

4. X-ray standing wave + PES

Targets

epitaxial layers, buried layers and interfaces, nano particles and clusters, organic semiconductors and metals, soft materials, liquid samples, etc.