WASHINGTON STATE UNIVERSITY

Department of Chemistry
PO Box 644630
Pullman,WA 99164-4630

January 02, 2009

Dear All

Here are some of the analytical techniques available in the Chemistry department at WSU:

XPS/Auger/UPS
AFM/STM
FT-IR/Raman
TGA/DSC
BET

XPS/ESCA and Auger: Kratos AXIS 165 multi-technique electron spectrometer.

XPS or ESCA
Two x-ray sources (MgKα and monochromatized AlKα)
Available spot sizes: 2mm, 120μm, 60μm and 30 μm.
XPS elemental mapping capability. Multipoint analysis and line scans capabilities.
Programmable depth profiling (Ar sputtering) and overnight acquisitions possible.
Cooled and heated stage with temperature range from -100 to 550°C

Auger:
Electron beam spot "size" of about 200 nm. Raster size up to a square mm.
Elemental Auger mapping and line scan capabilities.
Low magnification SEM imaging available. A routine SEM magnification of x5000 can be attained.
Atomic concentration of the detected elements available for both techniques.
Curve fitting using commercial software: CasaXPS.

Ultraviolet photoelectron spectroscopy (UPS):
A homemade helium lamp attached to the AXIS.
Energies available: 21.2 eV (HeI) and 40.8 eV (He II) (monochromatized lines).
Energy resolution of about 150 meV. Spot sizes: the same as for XPS.

Scanning Probe Microscopy (AFM and STM): Digital Instruments (DI)
Controller: Nanoscope III and Picoplus MI

Atomic force microscopy (AFM),
Contact, Tapping and non-contact modes available.
DI Cantelevers: Si_3N_4 and Si

Scanners: 100 μm (J) and 10 μm (E) maximum raster sizes.
Scanning tunneling microscopy (STM)
Air STM: tungsten and Pt-Ir tips

The infrared spectrometer: Bruker IFS 113 vacuum bench and ThermoFisher Is10

Globar source, Ge-coated KBr beam splitter and a wide band LN2 cooled, HgCdTe detector.
Evacuated bench below 20 mBar (Bruker).
Optimum resolution of 0.5 cm^{-1}.
Transmission, Absorption and Reflection-absorbance modes available.

Raman spectrometer:

Argon Ion laser excitation. Computer controlled data acquisition
Resolution to below 10 cm^{-1} on strongly scattering samples
Solution, powder or thin film samples

TGA-DSC7—Perkin-Elmer

TGA: 0.1 microgram weight change detection and temperature range from RT – 1000 °C with rate of 0.1°C/min to 200°C/min
DSC: can be operated from -170°C to 730°C with special pans. Aluminum pans for solid and volatile samples allow max T of 600°C.

Rates for these techniques are listed below:

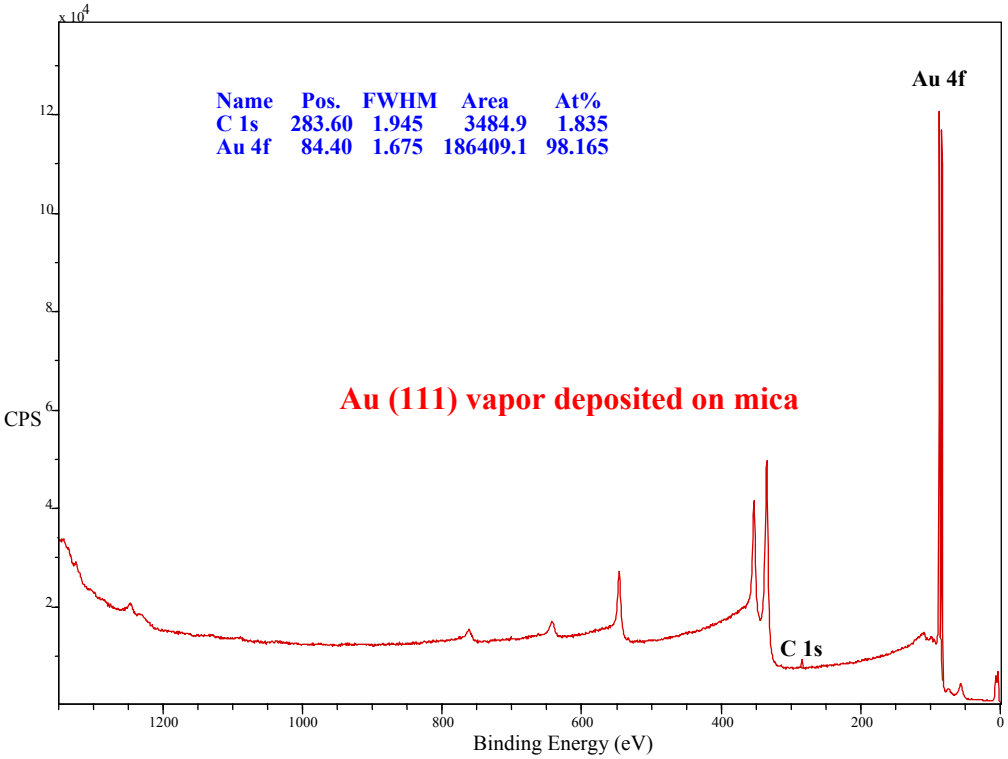
The following rates include routine data acquisition, electronic copies and a brief summary of the results to be e-mailed to you free of charge.
The sample (s) will be sent back to you at the client expense.

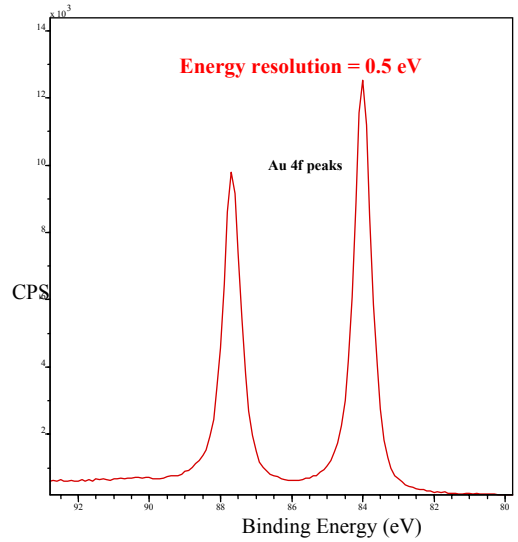
XPS	$200/h (Monochromatic and achromatic X-ray sources)
Auger	$200/h
UPS (HeI and HeII)	$200/h
SPM	$100/h (training available at this rate then the hourly rate for users is $20/h, cantilevers and tips not included)
IR and Raman:	$75/h
TGA/DSC	$75/h

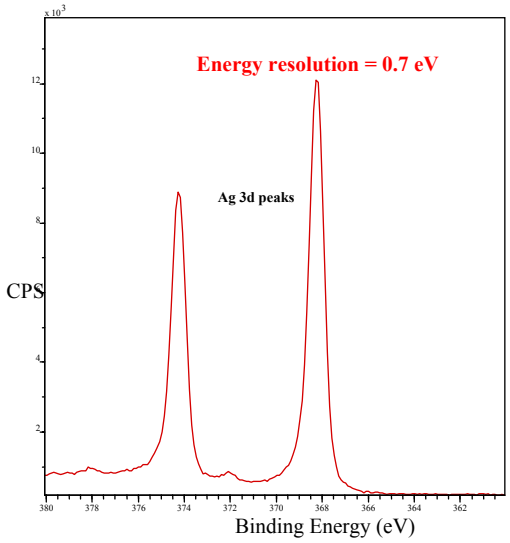
Note: I will always be available via e-mail and will try to answer most of your questions by the following working day.
Secondly, the cost for jobs involving more complicated analysis will have to be negotiated.
Finally, the cost of analysis in the case where a publication may result will have to be negotiated.

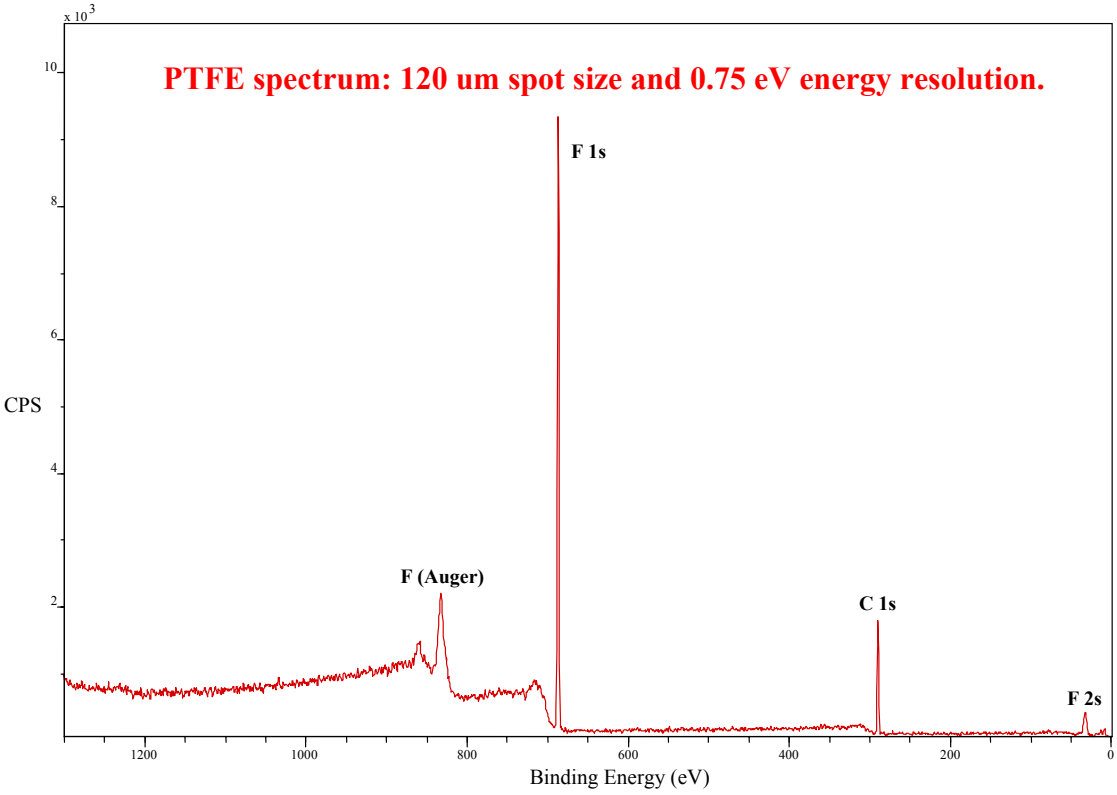
Examples of data:

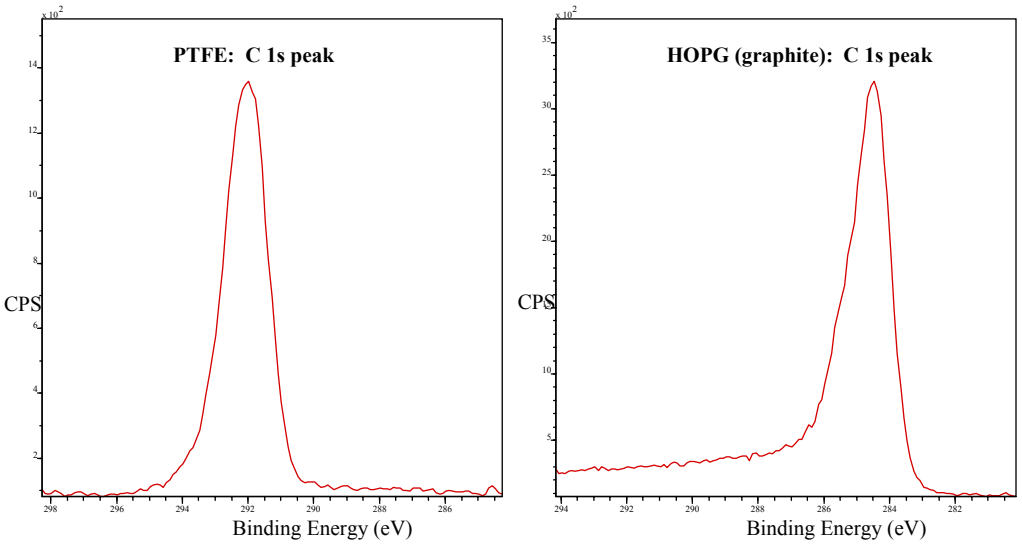
1. XPS/ESCA spectra



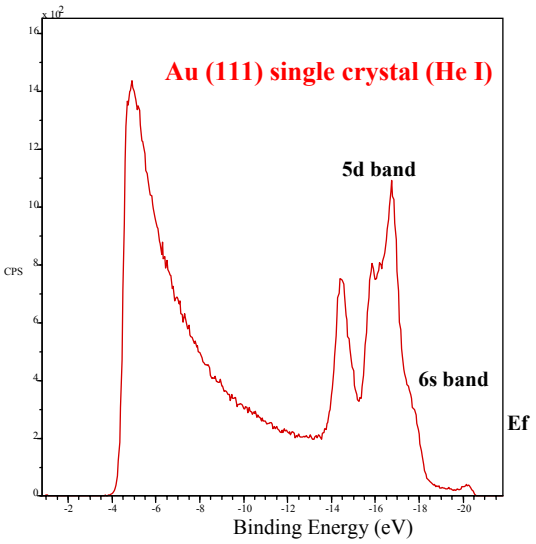


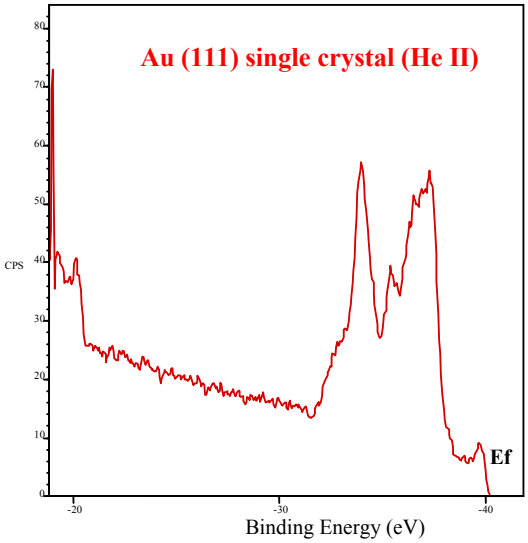



PTFE spectrum: 120 um spot size and 0.75 eV energy resolution.
x 10^3
CPS
F 1s
F (Auger)
C 1s
F 2s
Binding Energy (eV)

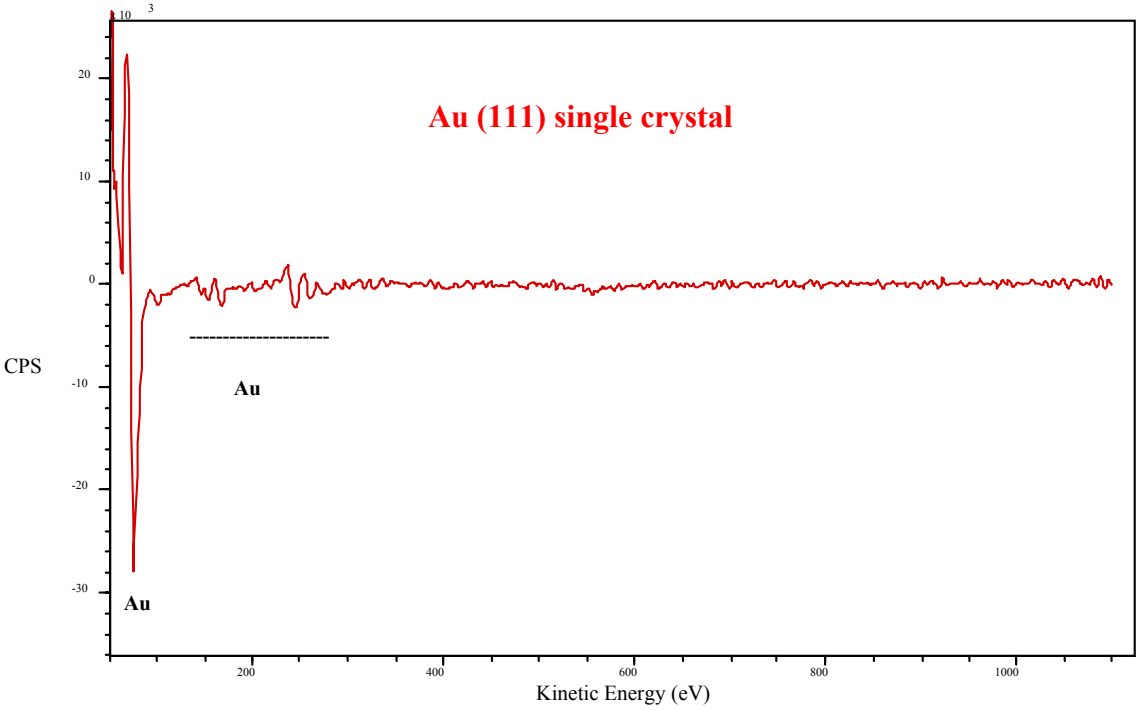

PTFE: C 1s peak
HOPG (graphite): C 1s peak
CPS
Binding Energy (eV)

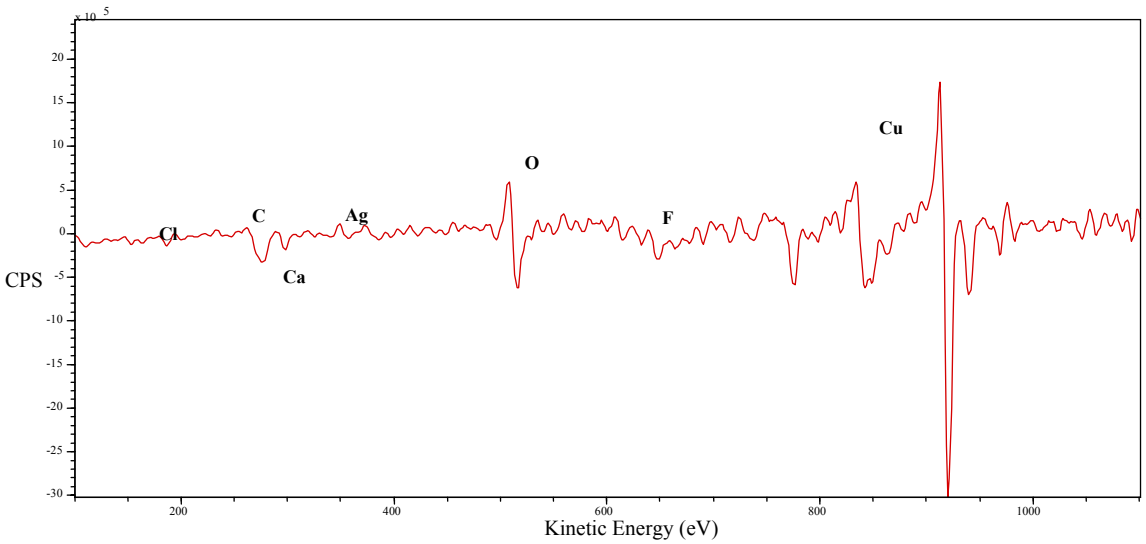
2. Ultraviolet photoelectron spectroscopy (UPS)



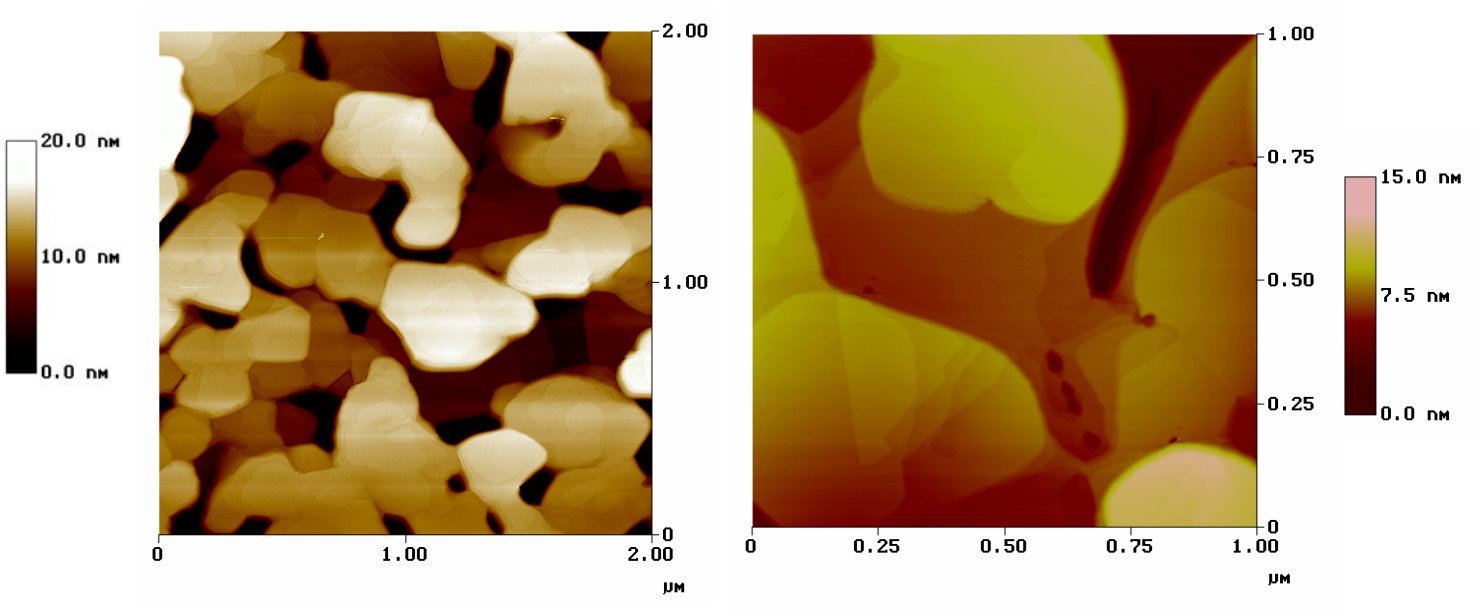


3. Auger spectra





4. AFM and STM images of epitaxial Au (111) on mica



AFM **STM**

If you have more questions about our facilities, please do not hesitate to contact me. My phone number is 509-335-2669 and my e-mail address is scudiero@wsu.edu

Sincerely,

Louis Scudiero, Ph.D.