



NanoLab Delivers!

# 'Client-Analyst Discussion'

## Sample History

### Analytical Services On Demand

Your Name: \_\_\_\_\_

Today's Date: \_\_\_\_\_

### Help Us Help You

To improve the results we produce for you, this form outlines many of the questions that we might ask you about your samples or problems. There is no need to answer all questions, but the more info we get, the better we can make your data and satisfy your needs.

If you happen to have a digital photo of the part, we hope you can share a copy. Thanks!

### Type of Work Needed

- Chemical Analysis
- Circuit Testing
- Disassembly
- Imaging
- Sizing
- \_\_\_\_\_

### What Info (not data) do you Need?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### Deadline for Data Report

- Today
- Tomorrow
- 2 business days from today
- 3 business days from today
- 4 business days from today
- 5 business days from today
- next week \_\_\_\_\_

### Your Company/Section

- Production Line
- Engineering
- R&D
- QC
- Incoming Material
- Competitive Studies/Lega/IP
- \_\_\_\_\_

### Purpose of Work

- Setup Quality Control
- Solve a Problem
- Answer Question
- Characterize Material
- Competitive Analysis
- IP Litigation
- \_\_\_\_\_

### Feature(s) Visible in Microscope

- Blistering
- Bond/solder failure
- Bubbles
- Color wrong, staining
- Contamination
- Corrosion
- Defects
- Degradation
- Delamination, peeling
- Fractures
- Haze
- Particles
- Residue
- Spots
- Wear marks
- \_\_\_\_\_

### Known Chemistry of Part

- C, O, H (surface contamination)
- Si
- \_\_\_\_\_
- \_\_\_\_\_

### X-Y Size of Feature (diameter)

- 1-10 nm
- 10-100 nm
- 100-1000 nm (1μ)
- 1μ - 10μ
- 10μ - 100μ
- \_\_\_\_\_

### HEIGHT of Feature ABOVE Surface

- 1-10 nm
- 10-100 nm
- 100-1000 nm (1μ)
- 1μ - 10μ
- 10μ - 100μ
- \_\_\_\_\_

### DEPTH of Feature BELOW Surface

- 1-10 nm
- 10-100 nm
- 100-1000 nm (1μ)
- 1μ - 10μ
- 10μ - 100μ
- \_\_\_\_\_

### Full Size of Part - As Submitted

- X direction \_\_\_\_\_ mm
- Y direction \_\_\_\_\_ mm
- Z direction \_\_\_\_\_ mm
- or
- X direction \_\_\_\_\_ inch
- Y direction \_\_\_\_\_ inch
- Z direction \_\_\_\_\_ inch

### Production Methods Used

- Plasma treatment
- ALD coated
- CVD coating
- MBE coating
- Magnetron sputtering
- Heat treatment
- Anodized
- Ion implanted
- Plating
- Electroless plating
- \_\_\_\_\_

### Sample Storage at Nanolab

- Store in dry box before analysis
- Store in nitrogen box before analysis
- Store under DI water until analysis
- Store under hexane until analysis
- \_\_\_\_\_

### Sample Treatments by Nanolab

- None, as-received only
- Argon ion etched 1 minute
- Scraped clean with knife
- Scraped under hexane
- Carbon reduction by Ar+
- Freeze fracture under argon
- RT fracture under argon
- Selective solvent cleaning
- Overnight drying (1 atm)
- Overnight drying ( UHV)
- Frozen in LN<sub>2</sub> before analysis
- Plasma cleaned before analysis
- UV-ozone cleaning
- Piranha cleaning
- Ultrasonic - solvent cleaning
- Electric arc treatment in air
- Surface derivatization
- Carbon/gold coated
- \_\_\_\_\_

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Free consultation by phone.  
First hour of analysis is free.  
Work On-Site with us.



**NanoLab Delivers!**

**Frequency of Problem**

- Rare, but very serious
- One-of-a-kind-sample
- Every part
- 10% of the time
- Once a month
- \_\_\_\_\_

**Sample Preparation by Nanolab**

- None, as received only
- Polishing
- Cross-sectioning for TEM
- Cross-sectioning for SEM
- Thinning for Xradia microscope
- FIB cut for TEM
- Hand polishing for TEM
- Cr sputter coat for TEM
- Pt sputter coat for TEM
- Thermal Cr coating for TEM
- C sputter coat for SEM
- C sputter coat for TEM
- Paralene coat for TEM
- Au(Pd) sputter coat for SEM
- Freeze fracture in air
- Freeze fracture in Argon
- Lightly sand the surface
- \_\_\_\_\_

**Instrument Customer Prefers**

- XPS (Thermo K-Alpha)
- XPS - 300 mm (Thermo, Theta-300)
- EDX (Oxford)
- SEM (FEI NovaSCAN)
- FIB (FEI Helios, 100 mm)
- FIB (FEI Altura, 200 mm)
- FIB (FEI V600)
- TEM (JEOL 3010 300 kV)
- STEM (FEI Tecnai 300kV)
- X-ray Microscope (Dage)
- CSAM (Hitachi FS200)
- SOM (SemiCap 4000)
- Digital Microscope (Keyence)
- \_\_\_\_\_

**Got a Question!  
Let's Talk. Give us a Call.**

**Location of Problem Area**

- Microscope shows the problem area
- Electric testing shows problem area
- X-rays show problem area
- Laser testing shows problem area
- Optical test shows problem area
- We will send a schematic
- We will send a drawing
- We drew a circle around problem
- We scribed a circle around problem
- We can not send
- \_\_\_\_\_

**When does Problem Occur?**

- After heat treatment
- After wash/rinse
- After storage
- After humidity test
- After temperature test
- As received from supplier
- In BEOL
- In FEOL
- At customer site
- After exposure to light
- After laser treatment
- After ion milling
- After sputter deposition
- After ALD/CVD/MBE
- \_\_\_\_\_

**Suspected Causes**

- Overheating
- Excess Humidity
- Excess Pressure
- Physical stress
- Electrical stress
- Bad chemistry
- Wrong chemistry
- Contamination
- Aging in storage
- Migration
- Diffusion
- Washing/rinsing
- Handling
- Rolling process
- Extruding process
- Incoming material
- \_\_\_\_\_

**CONTENT OF REPORTS**

- Summary of results - meaningful Info
- All spectra & plots (raw & processed)
- Elemental composition table(s)
- Chemical state assignments
- Image(s) of samples
- Data in ASCII format
- Analysis strategy agreed on
- Description of samples
- History of samples
- Description of the analysis
- Reference spectra as needed
- Suggestions for next steps

**State-of-the-Art  
Instrumentation**

**Sample History**

- Coated with Gold or Carbon for SEM
- Already analyzed in SEM
- Already analyzed by FIB-SEM
- Already analyzed with X-rays
- Already analyzed by SIMS
- Exposed to laser beam
- Exposed to heated oven
- Recently rinsed/washed
- Recently sanded
- Recently wiped clean
- Stored in box
- Stored in pastic bag
- Touched top with fingers
- Touched top with gloves on
- \_\_\_\_\_

**Complete Unknown**

- Chemistry is unknown
- Thickness is unknown
- Age is unknown
- Storage condition is unknown
- Production method is unknown
- Part is in litigation case
- Part is for competitive analysis
- \_\_\_\_\_



## NanoLab Delivers!

### Surface Density of Features

- >10 spots/dots per 1 x 1 μ area
- >10 spots per 100 x 100 nm area
- Continuous film/residue
- Dendrite pattern
- Evaporation ring pattern
- Looks like roughness
- \_\_\_\_\_

### Images of Problem

- We can share low mag photos
- We can share hi mag photos
- We have time series of photos
- We made scribe marks on sample
- We drew ink lines on sample
- \_\_\_\_\_

### Trace Level Detection Needed

- Need to measure 1 atom% level
- Need to measure 100 ppm level
- Need to measure 10 ppm level
- Need to detect in surface
- Need to detect in bulk
- \_\_\_\_\_

### Data, Images, Spectra

- Send data etc by e-mail
- Send data in paper form by US mail
- Send data in paper form by FedEx
- Send data on CD/DVD by US mail
- Send data on CD/DVD by FedEx
- Load data onto our FTP server
- Only need raw data
- Only need raw images
- Need peak labels
- Need atom % table
- Need chemical state labels
- Need processed spectra
- Need processed images
- Need depth profile plot
- Need thickness estimates
- Need calibration check
- Need size bar check
- Need etch rate check
- \_\_\_\_\_

### Type of Data Needed/Wanted

- As received
- After cleaning
- After ion etching
- SEM images
- CD-SEM results
- TEM images
- STEM images
- EELS spectra
- EELS line profile
- EELS map
- EDS (EDX) spectra
- EDS (EDX) map
- EDS (EDX) line profile
- EDS (EDX) depth profile
- FIB-SEM
- Cross-section
- Thickness of Layers
- Surface roughness
- Chemical state info
- XPS (ESCA) spectra
- XPS (ESCA) depth profile
- XPS (ESCA) map
- XPS (ESCA) AR-XPS
- X-ray microscopy
- Hi Res Digital Microscopy (2D or 3D)
- CSAM
- \_\_\_\_\_

### Thickness of Layers (-Z)

- Top layer (#1) \_\_\_\_\_nm
- Layer #2 \_\_\_\_\_nm
- Layer #3 \_\_\_\_\_nm
- Layer #4 \_\_\_\_\_nm
- Layer #5 \_\_\_\_\_nm
- Layer #6 \_\_\_\_\_nm
- Layer #7 \_\_\_\_\_nm
- Layer #8 \_\_\_\_\_nm
- Layer #9 \_\_\_\_\_nm
- Bulk / substrate \_\_\_\_\_mm

### Publishable as Application Note

- Will this data be published
- May we make an application note?
- What journal will it appear in?
- \_\_\_\_\_

**You bring the samples,  
We provide the results you need.**

### Diassembly - Failure Analysis

- De-cap / De-lid needed
- Die removal
- Cross-sectioning
- Ion polishing
- Wet chemical etch
- \_\_\_\_\_

### Desired Analysis Conditions

- As received
- After light ion etch
- High spatial resolution - pin points
- Large area for homogeneity check
- High energy resolution for chem states
- High sensitivity for detection limits
- \_\_\_\_\_

### Quality of Data Needed

- QC mode
- Quick, minimum quality
- High precision
- High accuracy
- Repeatable inside Nanolab
- Reproducible outside Nanolab
- \_\_\_\_\_

### One-of-a-Kind Sample

- Identical sample available
- Only sample in existence
- Hard to reproduce
- Too expensive to reproduce
- Need extreme handling caution
- \_\_\_\_\_

### Return Samples, Trash or Destroy

- Return samples at your expense
- Return samples by our courier
- Keep samples on file for 3 months
- Keep samples on file for 6 months
- Discard samples
- Destroy samples and discard
- \_\_\_\_\_



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If your sample has multiple layers of materials, please list them here. Thanks!

### Side View of Multi-layer Thin Film System

Expected Thickness (nm)

Adventitious Carbon, Water, Trapped Air

Expected Chemical Elements (C, O.....)

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Expected Thickness (nm)

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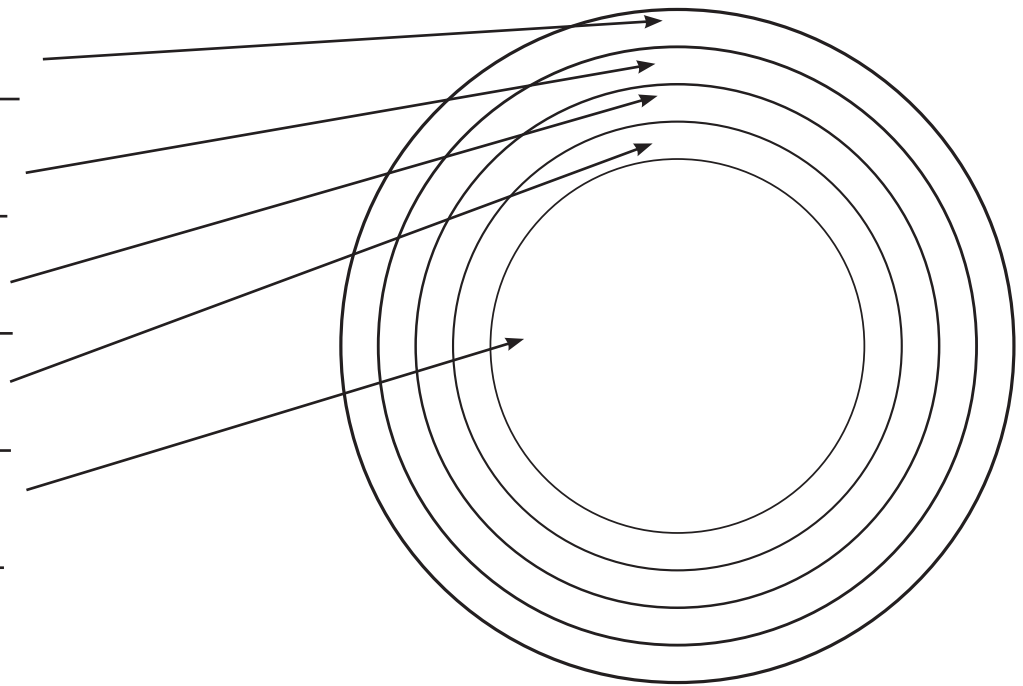
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**NanoLab Delivers!**

The spaces below are provided for you to hand-draw the sizes and shape of your part.

Large empty rounded rectangular box for hand-drawing the part.

Large empty rounded rectangular box for hand-drawing the part.