





4th I-Talk

Title:Brief Introduction to XRD System &Type of XRD Measurements @ INOR



Date: 04 Nov 2020 (Wednesday)

Time: 11:00 am to 11:45 am

Webinar Link: https://usm-cmr.webex.com/meet/wanrosdan

Speaker: Assoc. Prof. Dr. Ng Sha Shiong

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For further information, please contact:

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Presentation Outline:

- Bruker AXS D8 Discover XRD system
- Type of XRD measurements
- Type of XRD analysis software & Database
- XRD analysis request form
- Q&A

For more information, please refer to : <u>https://www.bruker.com/</u>

D8 DISCOVER DAVINCI design

	X-ray source					
Generator	3 kW					
Cooling	Water					
Sealed Tube	2.2 kW Cu (Cu Kα = 1.54056 Å)					
Primary Optics						
TRIO Optics	1.Div. Slit 2.Goebel Mirror 3.Ge 2B-Mono					
Attenuator	Automatic					
	Sample Stages					
	Sample Stages					
Cradle	Chi, Phi, X, Y, Z					
C						
Secon	d. Optics & Detectors					
Pathfinder +	1.Antisc. Slit					
Scinti. Counte	er 2.Equ. Soller 3.Cryst. analyzer					
LYNXEYE	1D Silicon strip					



Bruker AXS D8 Discover XRD system

- Commission on 30 September 2019.
- Cost about RM 1.5 mil.
- Alignment free diffractometer and fully (~90%) automated
- For powder, thin films, and **epitaxy films** analyses.

Bruker D8 Discover XRD system



Alignment Free Diffractometer & DAVINCI Design



DAVINCI.SNAP-LOCK – changing components without tools

- Alignment free exchange
- All optics return to perfect alignment







DAVINCI.MODE – real-time component recognition



DIFFRAC.DAVINCI – the virtual goniometer

- Component register by itself
- Component properties applied automatically (e.g. beam offsets, drive activation)

- Graphical display of active components with their current status
- Real-time conflict detection





Virtual goniometer (DAVINCI Design)







Bruker D8 Discover XRD system

• Key Accessories





Sample holder



Type of XRD measurements

PA

XRR

RSM

GID

RC

- Phase Analysis (PA):
 - Powder
 - Thin films (amorphous, polycrystalline, etc)
 - Epitaxial films
 - Grazing Incidence X-ray Diffraction (GIXRD or GID):
 - Thin films (amorphous, polycrystalline, etc)
 - Epitaxial films
- X-ray Reflectivity (XRR):
 - Thin films (amorphous, polycrystalline, etc)
 - Epitaxial films
 - Thickness < 100 nm.
 - Rocking Curve (RC):
 - Epitaxial films
- Reciprocal Space Mapping (RSM):
 - Heterostructure Epitaxial films







Type of XRD analysis software & Database





 Phase identification and semi-quantitative phase analysis

2) TOPAS:

- Profile analysis, quantitative analysis, structure analysis
- Rietveld Analysis
- 3) Laptos:



Thin film analysis/Residual stress
investigation

Databases:

- a) ICDD PDF2 Minerals
- b) Crystallography Open Database (COD)





XRD analysis request form



INOR.CHAR.FRM.v.



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- Max samples per request form = 8
- Submit the completed form to:



Rahmawatini Abdul Rahman

Assistant Science Officer rahmawatini@usm.my +604-6535647



Mohd Aiezat Zulkeply

Assistant Science Officer aiezat@usm.my +604-653 5645

- For MSc Mixed students:
 - XRD measurements will be carried out during Saturday (upon request).
- Guideline:
 - Do literature search XRD information about your sample
 - Expected peaks from your samples
 - Understand your samples possible elements (important for phase analysis)

XRD ANALYSIS REQUEST FORM

Requestor Name	:							
Contact No.	:	Email :	Date :					
School/Company	:							
Category	:	Other Dept. :						
Sample Type	: Thin Fi	Im	No. of Sample :					
Materials								
Substrate	:							
Please Tick Appropriate Bo	x							
X-RAY DIFFRACTION [XRD] ANALYSIS								
Powder / Pha	se Analysis	Thin film wit	h High Resolution (HR) measurement					
Normal Scar	1	Rocking Ci	urve (RC)					
Low noise ba	ackground scan (small quantity sample)	Double-Ax	is/Triple-Axis HRXRD					
Range:	deg. to deg.	Standa	rd Range					
		Extende	ed Range					
Thin film		Reciprocal	Space Mapping (RSM)					
Grazing Inci	dence Diffraction (GID)	Normal	Scan					
X-ray Reflec	tivity (XRR)	Ultra Fi	ne Scan					

Other information about the sample (e.g. sample stability/temperature) :					
Supervisor Approval: (if Students, need to get the approval from Supervisor)					
	ability/temperature) : Supervisor Approval: (if Students, need to get the approval from Supervisor)				





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Characterization Analysis

No.	Type of services	INOR Co-Supervision	Other USM's school	IPTA/IPTS	Industry		
1.	Probe Station w/o Sample Prep (per sample)						
	a.) CV Measurement	RM 50	RM 80	RM 100	RM 150		
	b.) IV Measurement	RM 50	RM 80	RM 100	RM 150		
	With Sample Prep (add on)	Additional charge depend on material					
2.	Photoluminescence (PL)	RM 50	RM 80	RM 100	RM 150		
3.	Electroluminescence (EL)	RM 50	RM 80	RM 100	RM 150		
4.	4. X-Ray Diffraction System (XRD)						
	a.) Powder/Phase Analysis						
	(i) Normal scan	RM 100	RM 120	RM 150	RM 300		
	(ii) Low noise background scan (Small quantity powder)	RM 120	RM 150	RM 180	RM 350		
	b.) Thin film						
	(i) Grazing Incidence Diffaction (GID)	RM 120	RM 150	RM 180	RM 350		
	(ii) X-ray Reflectivity (XRR)	RM 120	RM 150	RM 180	RM 350		
	c.) Thin film with High Resolution (HR) measurement						
	(i) Rocking curve (RC)	RM 150	RM 200	RM 300	RM 500		
	(ii) Double-axis/Triple-Axis HRXRD						
	Standard Range (5 deg)	RM 150	RM 200	RM 300	RM 500		
	Extended Range (8 deg)	RM 150	RM 200	RM 300	RM 500		
	(iii) Reciprocal Space Mapping (RSM)						
	Normal Scan	RM 150	RM 200	RM 300	RM 500		
	Ultra Fine Scan	RM 500	RM 1,000	RM 1,500	RM 2,000		

* All charges does not include 10% Sales and Services Tax (SST).







Q & A



Thank You

"To become a global centre of excellence in multidisciplinary research field of nanotechnology and optoelectronics"

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