NM-008 X-ray Diffractometer - XRD

I. System Specifications and Model:

1. Model: PANalytical X'Pert Pro (MRD)
2. X-ray Light Source: Copper target (Kα; λ= 0.154nm)
3. Detector: Proportional counter
4. Beam Size: 12mm × 0.4mm
5. Specimen Size: Chips from 1.2cm × 1.2cm to 4 inches
6. ω/2θ Highest Resolving Power: 0.0001°
7. Operating Environment: An atmosphere of 1atm
8. First Optical Module: X-ray mirrors.
9. Second Optical Module: Parallel plate collimator (PPC).

II. System Appearance:

The system mainly consists of 5 parts: (1) X-ray tube; (2) first optical module; (3) sample cradle; (4) second optical module; (5) detector. (The structure is depicted in the following image)

III. Function Description:

Crystals are solids in which atoms or atomic groups are arranged in repeating patterns. When an X-ray enters a crystal, it is scattered by the atoms. When there is a certain phase relationship

(phase difference) where two or more scattering waves overlap, the diffraction phenomenon occurs. The XRD uses the detector to collect diffraction signal intensity to get the diffraction pattern of the tested sample. Generally, such diffraction pattern shows the diffraction intensity at different diffraction angles. After crystal planes are marked in the diffraction pattern, the crystal structure of the tested sample can be derived. The most prominent feature is nondestructive measurement. Common XRD analysis methods are as follows:

	Analysis Item	Test Description	Example
1	Powder Phase Identification Analysis (θ-2θ or Gonio Scan)	Material crystal phase identification, where the Bragg diffraction theory is used for analysis and structures are determined using polycrystalline bulk materials, powder, and polycrystalline or monocrystalline thin film materials.	
2	Grazing Incidence Diffraction Phase Identification Analysis for Thin Film Materials (2θ Scan or GIXRD Scan)	Material crystal phase identification, where small grazing angles (incident angles of 0.5~3 degrees) are used for incidence to reduce the crystal plane diffraction signal of parallel substrates. This is mainly used to identify the diffraction signal of surface materials.	
3	X-RAY Reflectivity, (XRR scan)	XRD Reflectivity-to know the density of the thin film, thickness of the film and the roughness of the interface between the two film.	

IV. Notes on Specimen Sampling:

1. Analysis specimen sampling specifications: 1.2cm × 1.2cm to 8-inch chips

2. If you want to know the grain size, please note on the paper.
3. Contact information, charge plan, and commission link

✓ Contact Information:

Contact Person	Ext.	Email	Instrument Location
Yi-Ching Huang	7773/7409	1505015@narlabs.org.tw	R204
Mei-Ling Kuo	7780/7409	ivykuo@narlabs.org.tw	R204

✓ Charge Plan:

Instrument No.	Instrument Name		Charge Plan		
			Charge Plan for Self-operation (NTD/sec.)	Charge Plan for Commission for Operation (NTD/hr.)	Note
NM-008	X-ray Thin Film Diffractometer (XRD)	θ-2θ scan / GIXRD/XRR	0.6	3,000	
Note: If the time commissioned for operation is less than half an hour (30 minutes), it is counted as half an hour.					

✓ Commission Link:

To request commission services, please go to: **MES System and External Service System and make a request**