**Dr B R AMBEDKAR NATIONAL INSTITUTE OF TECHNOLO(** **TEQIP-II**
**G T Road By Pass, Jalandhar-144011, Punjab (India)**
EPABX-0181-2690301, 2690453 Fax: 2690320, 2690932 email: teqip@nitj.ac.in

## CORRIGENDUM

## (Amendments in Technical Specifications and others condition after pre-bid conference held on 27.01.2017)

As per the IFB / Tender Notice No. NITJ/TEQIP-II/NCB/2017/Modernizing-NITs/02 published on 17.01.2017, a pre-bid conference, for the following machine / equipment, was held on 27.01.2017 for clarifying the issues and doubts about technical specifications and other allied technical / commercial details of the IFB/ Tender document:

**Powder X-Ray Diffraction (XRD) System**

In this connection, prospective bidders are requested to note the revised technical specifications and other techno-commercial conditions and details before quoting the same.

Others terms and conditions and schedule or receipts and opening of bids against the said IFB/ Tender Notice shall remain the same.

**Nodal Officer (Procurement)**
**TEQIP-II**

**Dr B R AMBEDKAR NATIONAL INSTITUTE OF TECHNOLO(** **TEQIP-II**
**G T Road By Pass, Jalandhar-144011, Punjab (India)**
EPABX-0181-2690301, 2690453 Fax: 2690320, 2690932 email: teqip@nitj.ac.in

## Revised Technical Specifications for "Powder X-Ray Diffraction System"

Name of machine / equipment /item: Powder X-Ray Diffraction (XRD) System: The systems supplied should be primarily designed for performing X-ray diffraction on powders samples having sealed tube X-ray source and theta-theta goniometer for horizontal sample mounting in a Bragg-Brentano focusing geometry. Powder XRD System with latest model such as EMPYREAN, SmartLab 3, ADVANCE DAVINCI, or similar level models from various vendors should be supplied. The entire system should be provided with the following specifications:

### 1. Scope of Supply

X-ray diffraction system is a complete stand alone unit consisting of:

- X-ray generator
- X-ray tube
- Diffractometer
  - Goniometer (vertical/horizontal axis)
  - Detectors for the system
  - Slits/ filters
  - Sample stage
- Software/ Computer/ Printer
- ICDD and ICSD database (01 Nos. License)
- Safety protection systems
- Water chiller for the machine operation
- Other requirements

### 2. Technical Specifications

#### 2.1 X-ray Generator

- Maximum output power :Ó3.0KW
- Maximum high voltage :Ó50KV
- Maximum current :Ó60mA
- Output Stability :ÓVoltage and current stability of ±0.05% or better (for 10% input power supply fluctuations)

- Power of the generator (voltage and current) should be software controlled. The software should be installed in the computer, provided with the system.

#### 2.2 X-ray tube

**1)** Copper anode tube: (1 No.)

- Water cooled x-ray source should be sealed ceramic/ glass x-ray tube of the following material:
  - Copper (Cu) X-ray tube
  - Power requirement: 2.0 KW or better
- It should be line focus and point focus in the same tube.
- Second X-ray tube should be supplied as and when required installed on the machine.

**2.3 Diffractometer**

**Goniometer**

- Type : Vertical scanning (Horizontal axis) type ɗ-ɗ geometry
- Geometry : Bragg Brentano Focusing geometry
- Scan Mode : 1. ɗ-ɗ coupled mode (Incident and detector arms should be coupled so that the ɗ and ɗ movement should be in the ratio of 1:2)
  2. ɗ and 2ɗ independent mode
  3. Continuous scan mode
  4. Step scan mode

- Lowest Scanning speed :Ò0.05$^{O}$/ min
- Highest scanning speed : Ó20$^{O}$/ min
- Goniometer Radius :Ó240 mm
- Scan range of 2ɗ :-10$^{O}$ to 160$^{O}$ or better
- Angle positioning :Optical encoders for positioning the goniometer
- Smallest addressable increment (2ɗ circle) : 0.001$^{O}$ or better
- Smallest addressable increment (ɗ circle) : 0.0001$^{O}$ or better
- Different modes of scanning, range of scanning, scanning speed and the scanning step (increment) should be software controlled.
  - The software for these scanning details should be available on the company supplied computer provided with system.
  - Goniometer along with the above specifications should include following components mounted on its arms:

**Detectors for the system**

- 0d and 1d detector with scanning and static mode.

**3. Slits and Filters**

- Necessary optics to include the divergence, antiscatter, receiving slit, soller slit arrangements for powder X-ray diffraction.
- 5 or more slits should be provided which covers the range of 0.01 mm to 7 mm pc controlled.
- Suitable filter for removing $K_b$ signal should be provided for Cu and Mo anodes separately.

**4. Sample stage**

- Standard sample stage and sample spinning stage with speed in the range of 60-120 rpm
- Size of the sample holder should be such that a sample of at least 20 mm diameter or more could be mounted easily.
- Sample holders for mounting powder samples with a grove of 5/10/20 mm in diameter (50 Nos.).
- Auto sampler with 8 stage or more.

- Single suitable optics and software for thin film and nanomaterial analysis,
- Sample holder for performing X-ray diffraction measurements on thin film samples (20 Nos.)
- Zero background sample holder e.g. Si/quartz single crystal or equivalent for performing XRD measurement on small sample amount/size (~1-2$mm^3$) with cavity.

**5. Software/ Computer /Printer/UPS**

- Winodws based PC for software on a preloaded computer which alongwith the software control of the functions the software provided with the system, should be capable of performing following tasks:
  - Data acquisition and analysis which includes automatic and manual peak finding.
  - Background substraction, $K_{\check{U}2}$ striping, search match etc.
  - Data acquisition and control of the temperature should be software controlled.
  - 10 Nos. license of XRD analysis software should be quoted.
  - All this software should be provided as backup drive.
  - Printer: colour laserjet duplex printer with a minimum resolution of 1200 x 1200 dpi, for image and report printing suited for A-4 size paper.
  - UPS: 60KVA of standard make such as Emersion Libert, ***etc***. with minimum 2 hrs back up.

**6. ICDD and ICSD Database (01 Nos.)**

- PDF2, with license should be provided
- ICSD database should be provided
- Automatic search and match routines for identification of phases should be provided
- The data processing routine software for identification of accurate peak positions, background and profile parameters should be provided.

**7.** Six (06) Nos., 2 ton, Split Air Conditioners (4-star rating with timer or better) should be quoted.

**8. Safety protection system**

8.1 Personal safety

- Radiation enclosure with interlocking mechanism should be provided.
- Radiation outside the radiation enclosure should be less than 1µSv/hr.
- The doors of the radiation enclosure should be such that X-rays can be generated only after the door is closed.

**8.2 Instrument safety**

- All the necessary interlocks should be provided for X-ray tube protection and 24 hrs of continuous machine operation.
- Emergency stop switch should be provided.
- Indicators should be provided to display that X-ray is on.

- All the interlocks with respect to the water flow, water temperature etc. should be provided

**9. Water chiller for XRD machine**

Supplier should quote for suitable chiller according to the cooling requirement of the machine.

**9.1** Voltage and frequency of operation: (single phase) 220V (+/-10%)/50Hz (+/-1Hz).

Power required: single/three phase.

**10. Other requirements**

**10.1 Acceptance criteria**

1. The company should send the XRD patterns of the NIST standard samples, recorded on the machine after the fabrication of the system at the factory. Subsequently, they should demonstrate the same parameters after the installation of the machine at NIT Jalandhar. The set of NIST standard samples should be provided by the company.

2. To check the temperatures, company should send XRD patterns of the standard samples, recorded on the machine after the fabrication of the system at the factory, at the temperatures specified by the users. Subsequently, they should demonstrate the same parameters/ temperatures on the same samples after the installation of the machine at NIT Jalandhar. These set of standard samples which shows well defined transition temperatures, for testing the temperature, should be provided by the company.

**10.2 Installation/ commissioning/ Training**

1. The instrument should be installed, tested and commissioned by representative of supplier/company engineer at Dr B R Ambedkar NIT, Jalandhar, India, to the satisfaction of user.
2. Full-time site engineer/operator of qualification diploma/science graduate for the maintenance and operation of equipment. Operation of the equipment will be carried out by the mentioned operator from the company itself for a minimum period of three years from the date of installation and successful demonstration at NIT Jalandhar. The supplier should also provide adequate training to at least three persons at Dr B R Ambedkar NIT, Jalandhar, India.

**10.3 Documentation and warranty**

All the documents should be provided in English.

1. Complete set of manuals on operation of all the components of the hard and soft copy of all manuals of sub-systems.
2. Minimum three years warranty from the date of installation and successful demonstration of the system at Dr B R Ambedkar NIT, Jalandhar, India.
3. Alignment procedure and hardware setting should be clearly given.

In case of any failure within the warranty period, the machine should be attended by engineer within 15 working days. Any delay in attending to the failure beyond 15 working days will be added to 1 year more warranty period.

### 10.4 Essentials spares and consumables

1. Tool kit with all mechanical tools and accessories necessary for the system installation and regular operation should be provided.
2. Tool kit for onsite 2ɗ and ɗ alignments should also be provided.
3. Necessary spares and consumables required for smooth and efficient operation of X-ray generator and goniometer for five years should be quoted.

Note: The spares and support from the supplier should be available for 10 or more years from the date of installation and commissioning of the quoted model.

G T Road By Pass, Jalandhar-144011, Punjab (India)
EPABX-0181-2690301, 2690453 Fax: 2690320, 2690932 email: teqip@nitj.ac.in

## Qualification Criteria

The technical personnel to be deputed for the maintenance and operation of the machine should be Full-time site engineer/operator and must have qualification: diploma/science graduate.

**Dr B R AMBEDKAR NATIONAL INSTITUTE OF TECHNOLO(** **TEQIP-II**
**G T Road By Pass, Jalandhar-144011, Punjab (India)**
EPABX-0181-2690301, 2690453 Fax: 2690320, 2690932 email: teqip@nitj.ac.in

## Techno-Commercial Conditions and other details

1. **Delivery Period**: 15-20 days from the date of placing the purchase order.
2. **Installation**: within 15 days from the date of receipt of the machine in the Institute premises.
3. **Commissioning and Training**: Immediately after the Installation.
4. **Payment Terms**: 100% against physical delivery, inspection and submission of Bank Guarantee @ 110% of the total cost of the contract.