

NanoIndenter Central Facility, MEMS, IIT Bombay

REGISTRATION PROCEDURE FOR INTERNAL AND EXTERNAL USERS

To avail the Nanoindenter facility at MEMS, IIT Bombay. Registration is absolutely essential.

Following are the details of the Registration Process:

I) Internal Users:

Students/Post-docs/Project Staff currently studying within IIT Bombay are considered as Internal Users. They can apply from <http://drona.ircc.iitb.ac.in>. The form should be completely filled and all the sample details must be provided in the requisition form. Users are encouraged to be present at the time of analysis by taking prior appointment. If a user cannot be present, a mail should be sent immediately to nanoindenter@iitb.ac.in along with the details of the sample as mentioned in the form.

II) External Users:

Since the registration portal is not accessible from outside IIT Bombay. External users must send a mail to nanoindenter@iitb.ac.in for registration. External users are categorized as:

[1] Academic Institutions:

You can come in-person or send your samples along with a letter from the Head / Guide on your College/Institute Original Letter Head for registration stating that the analysis is for research purpose to qualify for academic concession. The letter should be addressed to Prof-In-Charge, Prof.Nagamani Jaya Balila, NanoIndenter Lab, Department of Metallurgical Engineering and Materials Science, Indian Institute of Technology Bombay, Powai,Mumbai-400076.

[2] Industry & Non- GovernmentAgencies:

You can come in-person or send your samples along with a letter for registration. The letter should be addressed to Prof-In-Charge, Prof. Nagamani Jaya Balila, NanoIndenter Lab, Department of Metallurgical Engineering and Materials Science, Indian Institute of Technology Bombay, Powai, Mumbai-400076.

[3] National R & D Lab's:

You can come in-person or send your samples along with a letter from your Institute Original Letter Head for registration stating that the analysis is for research purpose. The letter should be addressed to Prof-In-Charge Prof. Nagamani Jaya Balila, NanoIndenter Lab, Department of Metallurgical Engineering and Materials Science, Indian Institute of Technology Bombay, Powai, Mumbai-400076.

You are requested to mention in your request letter that “We agree to acknowledge the *Nanoindenter Facility of IIT Bombay* when the data from the Nanoindenter lab are used in our papers/reports/thesis”. List of such acknowledgements with appropriate reference will be communicated to Nanoindenter lab vide email ***nanoindenter@iitb.ac.in***.

Kindly send the publication reference (Journal name/volume number/names of the authors/date of issue of the publication etc.) to us as the continuing functioning of the lab needs this feedback.

CHARGES FOR USERS

[1] 1 slot = 40 indents (Low/High load RT)

[2] 1 slot = 15 scratches (Low/High load RT)

[3] 1 slot = *5 scanning images for indents/scratches (Low load)

❖ For scanning rate from 1Hz to 3Hz) - 5scanning images.

❖ If the scanning rate is below 0.4 Hz, the scanning may take more than 45minutes.

[4] 1 slot = 10 nano DMA indents (RT Low Load)

[5] 1 slot = 5 indents (Low load, High temperature-only in scanning mode) = 5 high temperature indents

[6] For any additional tests not listed here, the charges will be on slot hour basis. A maximum of four hour will be considered as one slot.

	Revised charges per slot (Rs.)			
	Category			
Type of experiment	Internal users	External academic	National R & D labs	Industry & Other Non govt. agencies
Nanoindentation/Scratch (Without imaging)	1,500/-	3,000/-	7,500/-	15,000/-
Nanoindentation/Scratch (With imaging)	1,500/-	3,000/-	7,500/-	15,000/-

Nano-DMA	1,500/-	3,000/-	7,500/-	15,000/-
High temperature indentation	2,500/-	5,000/-	12,500/-	25,000/-
Additional tests defined by the user	3,000/-	6,000/-	15,000/-	30,000/-

Note: For Internal students: The TA's of the instrument and independent off-hour users will be charged 50% of the rate that are fixed for internal.

Payment mode: Payment can be made either 1) Online or by 2) Demand Draft payment.

1) Online payment: Payment should be made in advance. The link regarding the for online payment procedure is https://drona.ircc.iitb.ac.in/ircc/faculty/IRCC_Circulars/ECSBankDetails20150305.pdf.

2) Demand Draft payment :

Payment should be made in advance by a Demand Draft (DD) drawn in favor of "The Registrar, IIT Bombay, P and C Account".The same should be sent to the Prof-In-Charge, Prof Nagamani Jaya Balila at the above mentioned address.

- **Appointment:** The users will be informed about their date and time-slot by email.
- **Sample Submission:** Samples are to be submitted at the time of registration or brought along on the date of your appointment for your sample analysis. Samples without DD/advance payment will not be entertained.
- **Results:** After the sample analysis is complete the results will be sent by email for external users.

Instructions for sample preparation

- 1) Optical microscope available in the machine for optically locating the sample is 10x and 50x.
- 2) Sample specifications: We have a steel stub of 10mm diameter on which we glue the sample with the help of feviquik. The stage is magnetic we place the steel stub with glued sample on the magnetic stage. The sample size should be less than 10mm. The height of the sample should be less than 5mm. Sample roughness has to be less than 200nm(mandatory).
- 3) Loose particles or thin films with porous coatings will not be entertained.
- 4) Powder samples will not be done. If pellet can be prepared of the powder by sintering, then it can be done.
- 5) Liquid samples cannot be done.

Instruction for Users

- 1) Preliminary literature survey has to be done for the load application and the user must be aware of the parameters to be used for his samples. If the sample is known then the parameters can be optimized by us.
- 2) Absence for the slot without prior information to the Nanoindenter lab will lead to debar of the student from another registration for 15days.
- 3) User should not apply for the slot if the sample is not ready.
- 4) Roughness value is mandatory and should be reported before the slot is allotted.
- 5) The user may also consider taking optical image/SEM image of the sample prior to the slot.
- 6) Slots will be provided as per the queue.
- 7) The slot timing is divided into Morning slot from 9:30am to 1:30pm and afternoon slot will be from 2pm to 6pm. If your samples are not completed in this time slot, then you have to apply for a fresh slot and book another slot. Time will not be extended for any user. Depending on the load function and the type of tests the timings will be scheduled.
- 8) Data will be given only in CDs or DVDs. It has to be brought by the user. Data collection time is from 9:30-9:45am and from 5:30pm to 5:45pm in weekdays.
- 9) Sample stubs should be returned to the lab immediately. If not returned, the data will not be provided to the users.
- 10) The user should be present at the time of the slot.
- 11) You can request for two consecutive slots only once in a week. If your experiments need more time then please drop a mail to nanoindenter@iitb.ac.in and cc to jayabalila@iitb.ac.in. We will accordingly allot you slot.
- 12) For cantilever bending experiments and resistance measurement experiments one full day slot will be given.

- 13) For High temperature tests, the user has to inform one week earlier. The set up and the calibration may take more than half a day. The slot will be allotted for two consecutive days.
- 14) For scratch tests or some specific tests, if the desired tip is unavailable with us the user can get their own tip which can be fixed in our transducer.
- 15) Scanning of the sample /SPM imaging of indents takes time. Lower scanning rates may consume an hour. Therefore, in the time slot whatever images possible to scan will be given.
- 16) Beyond 100 indents for high temperature testing, the user has to arrange for their own high temperature tip.
- 17) Beyond 50scans for scratch + imaging condition, the user has to bring their own tips.
- 18) **For TA's and Independent users for usage of the machine after official hours and non-working days:**

- i) Off-hour users can do measurements only on their own samples. For other users, a separate requisition form needs to be submitted even if off-hour time is to be allotted.
- ii) We will ban the users who are caught doing some other samples and the person whose sample they are doing for the entire year.
- iii) One week prior you have to inform about your experiments and the materials needed for your experiment is mandatory. Your requisition has to be there one week before on the basis of which a slot will be allotted to you on off-hour which you can do on your own.

Type of Indenters available

NANOINDENTER MEMS, IITB

Sr.no	Indenter Type	Diameter (nm/ μ m)	Type	Shape
1	Berkovich	~200nm	Low load	Three sided pyramidal
2	Berkovich	~ 700nm	High load	Three sided pyramidal
3	Conical	100 μ m	Low load	

4	Berkovich tip Temperature tip	~200nm	Low load	Three sided pyramidal
5	Sapphire sphere	1000 μm	Low load	Spherical
6	Sapphire sphere	1000 μm	High load	Spherical
7	Cube corner 90°		Low & High	
8	Acoustic emission(Cube corner)	~200nm	Low load	Cube corner

Note: Old Berkovich tips (worn out) can be used for scratch tests (low load/high load) if no quantitative analysis is needed.

Date: December 23, 2019