



Indian Institute of Science Bangalore

Prof. Mayank Shrivastava
Associate Professor
Department of Electronic Systems Engineering
Indian Institute of Science Bangalore
560012, Bangalore, Karnataka, India

Global Tender Notification for the Procurement of β -Ga₂O₃ Epitaxial Wafers

GTE Approval Number: IISc-GTE-2023-261

Publishing Date: 19/07/2023

Reference Number: DESE/LU/MSA/2/2023-24

Request for Quote from Global Original Equipment Manufacturer (OEM) or their authorized distributor for β -Ga₂O₃ Epitaxial Wafers

**Indian Institute of Science, Bangalore
(Last Date: 9th August 2023)**

Dear Sir/Madam,

Kindly send your best price quotation for the following item with various accessories on CIP, Bangalore basis to the undersigned. Your quotation should clearly indicate the terms of delivery, delivery schedule, payment terms, etc.

Your quote should also include mode of payment and should reach the undersigned, duly signed on or before 10.00 hours (IST) on 9th August 2023.

The quote must include all details of technical specifications of the item along with the commercial terms and conditions, the bill of materials, printed technical brochure and any other supporting document. Vendors will be required to submit a technical proposal and a commercial proposal in two separate sealed envelopes. Please enclose a compliance certificate, printed on your letterhead, along with the quote. The commercial bid must be in CIP Bangalore and the quotation should address to:

The Chairman,
Department of Electronic Systems Engineering
Indian Institute of Science, Bangalore – 560 012

I. Technical Specifications of the β – Ga₂O₃ Epitaxial wafer

General Description:

1. The wafer stack should consist of an n-type β – Ga₂O₃ epitaxial layer homoepitaxially grown on an n-type (001) β – Ga₂O₃ bulk substrate.
2. The wafer should be suitable for the fabrication of vertical devices. The front surface (one with the epi-layer) should have a rms roughness < 1nm (preferably, smoothed by Chemical-Mechanical Polishing).

E-mail : mayank@iisc.ac.in (write to msdlab.esse@iisc.ac.in for tender related queries)
Phone : +91-80-2293-2732
Faculty Web : <https://faculty.deese.iisc.ac.in/mayank/>
Institute Web : <http://www.iisc.ac.in/>



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Specific Description:

Specifications of the Epitaxial layer	
Growth Method	Halide Vapor Phase Epitaxy (HVPE)
Dopant	Si (n-type)
Carrier Concentration ($N_d - N_a$)	$\sim 1 \times 10^{16} \text{ cm}^{-3}$
Thickness	$\sim 10 \mu\text{m}$
Front Surface	Rms roughness < 1 nm (CMP)
Specifications of the underlying bulk substrate	
Growth Method	Edge-defined Film-Fed Growth (EFG)
Orientation	(001)
Diameter	Φ 4-inch ($\sim 100 \text{ mm}$)
Dopant	Sn (n-type)
Carrier Concentration	$\sim 1 \times 10^{19} \text{ cm}^{-3}$ (before epitaxial growth)
Thickness	$620 \mu\text{m} \pm 20 \mu\text{m}$
XRD FWHM	< 350 arcsec (Along [010] and [100] axes)
Offset Angle	$\pm 1^\circ$ (Along [010] and [100] axes)

II. Optional Items: (list the cost and discount separately)

1. Quantity of wafers: The final purchase order (PO) may include multiple quantities (up to 5 wafers). Therefore, in addition to quoting the price of 1 wafer, please also list the price of up to 5 wafers. Reduction in price if any as compared to that of a single wafer should be shown.

III. Additional Items (Must be added to compliance certificate as well):

1. Shelf Life: Please provide details of the wafer shelf life under ambient conditions.
2. Shipping: The quote must be in CIP/CIF-IISc Bangalore.
3. Cutting charges: Cost of cutting the wafer into dies of 10 mm x 15 mm size should be included in the quote.
4. Please include any other options currently available that can be added on in the future.



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All of the above-mentioned technical specifications are highly desired. However, lower technical specifications may be considered if the above-mentioned specifications are found to be unsuitable in financial terms. The Institute reserves the right to go for lower specifications taking into consideration its technical preferences and financial constraints. Vendors are encouraged to highlight the advantages of their product over comparable products from the competitors.

PI Terms and conditions (should be included in compliance certificate):

1. The vendor should have a good track record of delivering such products at universities/research institutions (please furnish the details).
2. Please provide a list of customers who have procured your equipment in the last 5 years.
3. The lead time for the delivery of the product should not be more than 8 weeks from the date of receipt of our purchase order (PO). The smallest lead time will be appreciated. Our expectation is shipment immediately after PO and full or part payment post-delivery.
4. On all systems the payment terms will be specified in the commercial proposal and is subject to negotiation.
5. The validity period of the quotation should be 90 days at least.
6. Please provide details of the contact person in India, in the southern region or in Bangalore who to contact in case of any fault with the delivered goods, and who to contact for future purchase of the wafer.
7. In case of proprietary product, please furnish the appropriate certificate.
8. See other Terms & Conditions in enclosed document in the next pages.

Sincerely,

Prof. Mayank Shrivastava
Associate Professor
Department of Electronic Systems Engineering,
Indian Institute of Science,
Bangalore, Karnataka 560012, India
Secretary (Ms. Rekha's) Contact: 9972525771
(On Behalf of Purchase Committee)
Email: msdlab.ese@iisc.ac.in (for tender related queries)



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Enclosures / Annexures

Annexure 1 – Terms and Conditions:

A) Submission of Tender:

1. All documentations in the tender should be in English.
2. Tender should be submitted in two envelops (two bid system).
 - a. Technical Bid (Part-A) – Technical bid consisting of all technical details and check list for conformance to technical specifications.

The technical proposal should contain a technical compliance table with 5 columns.

- i. The first column must list the technical requirements, in the order that they are given in the technical requirement below.
- ii. The second column should provide specifications of the instrument/product against the requirement. Please provide quantitative responses wherever possible.
- iii. The third column should describe your compliance with a “Yes” or “No” only. Ensure that the entries in column 2 and column 3 are consistent.
- iv. The fourth column should state the reasons/explanations/context for deviations, if any.
- v. The fifth column can contain additional remarks from the OEM. You can use this opportunity to highlight technical features, qualify response of previous columns, or provide additional details, compare your solution with that of your competitors or provide details as requested in the technical requirements table below.

- b. Commercial Bid (Part-B) – Indicating item-wise price for the items mentioned in the technical bid, as per the format of quotation provided in tender, and other commercial terms and conditions.

3. The technical bid and price bid should each be placed in separate sealed covers, superscripting on both the envelopes the tender no. and the due date. Both these sealed covers are to be placed in a bigger cover which should also be sealed and duly superscripted with the Tender No, Tender Description & Due Date.
4. The SEALED COVER superscripting tender number / due date & should reach **Chairman Office, Department of Electronic Systems Engineering, Indian Institute of Science, Bangalore – 560012, India** on or before due date mentioned in the tender notice. In case due date happens to be holiday the tender will be accepted and opened on the next working day. If the quotation cover is not sealed, it will be rejected.
5. All queries are to be addressed to the person identified in “Section 1 – Bid Schedule” of the tender notice.



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8. If price is not quoted in Commercial Bid as per the format provided in tender document the bid is liable to be rejected.
9. The Institute reserves the right to accept or reject any bid and to annul the bidding process and reject all bids at any time prior to the award of contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders.
10. Incomplete bids will be summarily rejected.

B) Cancellation of Tender:

Notwithstanding anything specified in this tender document, IISc Bangalore, in its sole discretion, unconditionally and without having to assign any reason, reserves the rights:

- a. To accept OR reject lowest tender or any other tender or all the tenders.
- b. To accept any tender in full or in part.
- c. To reject the tender, offer not confirming to the tender terms.

C) Validity of the Offer:

The offer shall be valid 90 Days from the date of opening of the commercial bid.

D) Evaluation of Offer:

1. The technical bid (Part A) will be opened first and evaluated.
2. Bidders meeting the required eligibility criteria as stated in Section 2 of this Document shall only be considered for Commercial Bid (Part B) opening. Further, Agencies not furnishing the documentary evidence as required will not be considered.
3. Pre- qualification of the bidders shall not imply final acceptance of the Commercial Bid. The agency may be rejected at any point during technical evaluation or during commercial evaluation. The decision in regard to acceptance and/or rejection of any offer in part or full shall be the sole discretion of IISc Bangalore, and the decision in this regard shall be binding on the bidders.
4. The award of contract will be subject to acceptance of the terms and conditions stated in this tender.
5. Any offer which deviates from the vital conditions (as illustrated below) of the tender is liable to be rejected:
 - a. Non-submission of complete offers.
 - b. Receipt of bids after due date and time and or by email / fax (unless specified otherwise).
 - c. Receipt of bids in open conditions.
6. In case any BIDDER is silent on any clauses mentioned in these tender documents, IISc Bangalore shall construe that the BIDDER had accepted the clauses as of the tender and no further claim will be entertained.
7. No revision in the terms and conditions quoted in the offer will be entertained after the last date and time fixed for receipt of tenders.



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8. Lowest bid will be calculated based on the total price of all items tendered for Basic equipment along with accessories selected for installation, operation, pre-processing and post-processing, optional items, recommended spares, warranty, annual maintenance contract.

E) Pre-requisites (if applicable):

The bidder will provide the prerequisite installation requirement of the equipment along with the technical bid.

F) Warranty (if applicable):

The complete system is to be under warranty period of minimum 1-3 years (year wise breakup value should be shown in the commercial bid) including free supply of consumables, spare parts and data analysis software from the date of functional installation. If the instrument is found to be defective, it has to be replaced or rectified at the cost of the bidder within 30 days from the date of receipt of written communications from IISc, Bangalore. If there is any delay in replacement or rectification, the warranty period should be correspondingly extended.

G) Annual Maintenance Contract (if applicable):

An annual maintenance contract for a period of at least 2 years post-warranty if the warranty is for 1 year, should be provided on completion of warranty period. AMC for 1 year is sought for warranty of 2 years, and AMC will be optional for 3 year warranty.

H) Purchase Order:

1. The order will be placed on the bidder whose bid is accepted by IISc based on the terms & conditions mentioned in the tender document.
2. The quantity of the items in tender is only indicative. IISc, Bangalore reserves the right to increase /decrease the quantity of the items depending on the requirement.
3. If the quality of the product and service provided is not found satisfactory, IISc, Bangalore reserves the right to cancel or amend the contract.

I) Delivery, Installation and Training (if applicable):

The bidder shall provide the lead time to delivery, installation and made functional at IISc, Bangalore from the date of receipt of purchase order. The system should be delivered, installed and made functional within 90 days from the date of receipt of purchase order. The supply of the items will be considered as effected only on satisfactory installation and inspection of the system and inspection of all the items and features/capabilities tested by the IISc, Bangalore. After successful installation and inspection, the date of taking over of entire system by the IISc, Bangalore shall be taken as the start of



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the warranty period. No partial shipment is allowed. The bidder should also arrange for technical training to the local facility technologists and users.

J) Payment Terms:

We prefer net 30 days.

K) General:

1. All amendments, time extension, clarifications etc., within the period of submission of the tender will be communicated electronically. No extension in the bid due date/time shall be considered on account of delay in receipt of any document(s) by mail.
2. The bidder may furnish any additional information, which is necessary to establish capabilities to successfully complete the envisaged work. It is, however, advised not to furnish superfluous information.
3. Any information furnished by the bidder found to be incorrect, either immediately or at a later date, would render the bidder liable to be debarred from tendering/taking up of work in IISc, Bangalore.



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Annexure – 2:

Declaration for acceptance of terms and conditions

To,
The Chairman,
Department of Electronic Systems Engineering
Indian Institute of Science,
Bangalore – 560012, India

Ref: Tender No: DESE/LU/MSA/2/2023-24

Dated: 19/07/2023

Supply of **β -Ga₂O₃ Epitaxial Wafers** at Prof. Mayank Shrivastava's Lab, Department of ESE, IISc Bangalore

Sir,

I've carefully gone through the Terms & Conditions as mentioned in the above referred tender document. I declare that all the provisions of this tender document are acceptable to my company. I further certify that I'm an authorized signatory of my company and am, therefore, competent to make this declaration.

Yours faithfully,

(Signature of the Bidder)

Name

Designation, Seal

Date: