PURCHASE AGREEMENT

pursuant to Section 409 and following of Act no. 513/1991 Coll., the Commercial Code, as amended

(hereinafter the "Commercial Code")

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Contracting Parties

Purchaser :	Masaryk University, Central European Institute of Technology
Registered office :	Kamenice 753/5, 625 00 Brno
ID no.:	00216224
Tax ID no.:	CZ00216224
Represented by:	prof. RNDr. Jaroslav Koča, DrSc.
Contact person:	Mgr. Alice Spáčilová

and

Seller:	Andrzej Wiśniewski COMEF Scientific & Research
	(Andrzej Wiśniewski COMEF Aparatura Naukowo-Badawcza)
Registered office:	2 Gdanska str. PL-40-719 Katowice, Poland
ID no.:	634-008-07-68
Tax ID no.:	PL6340080768
Represented by:	Andrzej Wiśniewski – an owner
	.....
Registered in:	Central Evidence & Information of Trading Activity of Poland (CEiIoDG)

Recitals

2.1 The Purchaser is the director of project called "CEITEC – Central European Institute of Technology" (hereinafter the "Project") and the beneficiary of subsidy for stated Project from Operational Programme 'Research and Development for Innovations' (hereinafter "OP RDI"). The purpose of stated Project is to build European Centre of Excellence in the field of life sciences and advances materials and technologies.

2.2 Contracting parties declare they are familiar with the duty to observe the publicity requirement within Structural Funds Programmes stipulated in Article 9 of Commission Regulation (EC) No. 1828/2006 and to observe Rules for Publicity within OP RDI in all relevant documents regarding the subject of performance of this Agreement

2.3 The Seller acknowledges pursuant to Section 2 Letter e) of Act No. 320/2011 Coll., on Financial Control in Public Administration, as amended, he is entity with the duty to interact on the exercising financial control and he undertakes himself to interact on the exercising financial control pursuant to listed law. This obligation also refers to those parts of the Agreement and documents related to the performance of this Agreement which are subjects to protection pursuant to specific law (e.g. as trade secrets, classified information) providing that law requirements will be fulfilled. The Seller also undertakes himself to analogous obligation to undertake also his possible sub suppliers.

Subject of Agreement

3.1. The subject of this Agreement (hereinafter the "Agreement") is the delivery of **system for atomic layer deposition (ALD) Al2O3, AlN, TiO 2, TiN, MgO, HfO2, La2O3, Nb2O5, Ta2O5 on various substrates**, as specified in Annex No. 1 to this Agreement (hereinafter the "Delivery", the "Device" or the "Goods") and providing of services consisting of device installation and putting in operation. The Seller's performance shall also include:

a) the transport of the device to the place of performance, the unpacking and inspection;
b) installation of the device, which shall be take place in two stages – first, to the existing place of laboratory no. A2/518, Technicka 2, Brno 616 69 and subsequently the device will be moved to the final area at the University Campus VUT, Pod Palackeho vrchem (assumption is the beginning of the year 2014);
c) the part of the installation shall be execution of the acceptance test after the installation in the contracting entity's laboratory: layer with a thickness of 30nm on 150mm silicon plate, tolerance in thickness calculated with 1σ (Termal Al2O3 <1.5%, Plasma Al2O3 <5%, Termal HfO2 <5%);
d) putting the goods into operation, verifying of proper function of the devices and their adjustment;
e) preparation and delivery of instructions for use and service and maintenance manuals in the Czech or English language, the completed system documentation shall be also a part of manuals;
f) operators training (min. 3 persons) on the contracting entity's premises;
g) delivery of declarations of conformity of all delivered devices with the approved standards;
h) make an overall summary of the delivered items;
i) removal and disposal of the all packages and other materials used during the performance of public contract, pursuant to Act No. 185/2001 Coll., on Waste and the Amendment of Some Other Acts, and pursuant to relevant Decree of City of Brno;
j) cleaning of the areas affected by the installation of the device;

k) immediate and free removal of defects claimed within the warranty period;
l) obligation of post-guarantee service for 5 years.

3.2 The definition of the subject of Agreement is further specified in the technical specification contained in Annex No. 1 to the Agreement. If the fulfilment of the Purchaser's requirements set out in paragraph 1 above and in Annex No. 1 to the Agreement and the proper implementation and operation of the required devices require any additional deliveries and works not expressly set out in paragraph 1 above and in Annex No. 1 to the Agreement, the Seller shall be obliged to procure or perform such deliveries and works at its own costs and include them in its performance without any impact on the purchase price.

3.3 The Seller undertakes, under the terms and conditions stipulated herein, to deliver the goods specified in Annex No. 1 to this Agreement properly, in time and at its own costs and responsibility to the place of delivery and hand it over to the Purchaser and perform the services and works specified in paragraph 1 above. The Seller shall be responsible for the delivered goods, services and works being performed with due professional care and in compliance with all applicable legal regulations, this Agreement and the relevant annexes to this Agreement and all applicable technical and quality standards.

3.4 The Purchaser undertakes to take over the delivered goods, services and works in a proper and timely manner. The Purchaser shall be obliged to pay the purchase price to the Seller under the terms and conditions and in the manner specified in the Agreement. By signing the Protocol on handover and takeover of the goods (the handover protocol), the Purchaser shall become the goods owner and shall assume the risk of damage caused to the goods.

1. For purposes of this contract:
   a) *Device installation* means its settlement in the place of performance, compilation, interconnection, connection of the goods to the supplies, notably to the electric power distribution, low-voltage and optical distribution and distribution of water, demineralized water, gas, technical gases, heat, cold or air condition (if the function of the goods is conditioned by such connection),
   b) *Putting the goods in operation* means its testing and verification of the functionality, alternatively its setting and also perform other tasks and activities necessary to ensure that the goods will perform agreed and usual purpose and operator training,
   c) *Operator training* means provision of the interpretation about construction and function of the device, demonstration of operation including the procedures of all routine measurements and maintenance of the device performed by its operator, methodical guidance and inspection of operators (min 3) in practical training of operation and maintenance of the device performed by its operator, examination of trained operators and the issuance of certification entitling trained operators to the operation and maintenance of device.

4

PURCHASE PRICE

4.1. The purchase price has been determined on the basis of the Seller's offer submitted in the tender as a maximum and non-exceedable with respect to the delivery specified in Article 3 of the Agreement and it shall amount to:

CZK **5 500 000,00** (in words: **five million five hundred thousand Czech crowns**), excl. VAT;

CZK 0 (in words: zero Czech crowns) of VAT;

CZK **5 500 000,00 (in words: five million five hundred thousand Czech crowns**) total price + VAT.

4.2. The price breakdown is set out in Annex No. 2 to the Agreement. The breakdown has been prepared on the basis of the itemised budget based on the technical specification and the business terms and conditions of the Agreement.

4.3. The price includes all costs associated with the goods delivery and performance of the agreed services and works, in particular the costs of the goods acquisition, including the production costs, costs of the goods transportation to the place of performance, including any costs of handling mechanisms, costs of the goods insurance, its guarding and its delivery and acceptance, taxes and charges associated with the goods delivery, costs of the accompanying documentation. The agreed purchase price is independent on the price development and exchange rate changes.

4.4. The Seller hereby declares that it is fully acquainted with the scope and nature of the Purchaser's requirements regarding the goods and that it has correctly determined, assessed and evaluated all the deliveries, services and works necessary for proper fulfilment of the Seller's undertaking arising from the Agreement and that the determination of the price has been based on:

a) verification of the subject of this Agreement;

b) inspection of the local conditions for the delivery performance;

c) incorporation of all technical and business conditions set out in the Agreement into the price calculation.

4.5. Unless expressly stated otherwise, all prices contained in this Agreement are quoted without applicable value added tax (the VAT) that shall be charged by the Seller in compliance with applicable legal regulations valid as of the taxable transaction date.

4.6. The purchase price is documented by the itemised budget. The Seller warrants that itemised budget is in full compliance with business and technical terms of the delivery agreed in this Agreement. The unit prices stated in itemised budget serve to the demonstration of financial volume of the delivered and installed goods. The unit prices stated in the itemised budget are the highest permissible prices throughout realization of the delivery. The Seller doesn't have the right to claim the increase in the agreed price due to mistakes or lacks in the itemised budget, if these mistakes are result of inaccurate and incomplete appraisal of the delivery.

4.7. The agreed price of the delivery shall represent the highest permissible price. A change of the price shall be possible only in the form of an amendment to the Agreement and only if the applicable VAT rates change after the execution date of the Agreement and prior to the handover and takeover date (only the VAT rate changes shall be taken into account in this respect).

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PAYMENT TERMS

5.1. The Purchaser shall not provide any deposit to the Seller.

5.2. The purchase price shall be paid after handover and takeover of the goods on the basis of tax documents (invoices) issued by the Seller.

5.3. If the Seller hands over and the Purchaser takes over the goods with no defects and shortcomings, the Purchaser shall pay the entire purchase price including VAT within the maturity period pursuant to Article 5.4. of the Agreement. If the Purchaser takes over the delivery with defects or shortcomings, the

Purchaser shall pay only 85 % of the purchase price and VAT in full amount within the maturity period pursuant to Article 5.4. The Purchaser shall pay lien in amount of 15 % of the purchase price after removal of the last defect and the last shortcoming stated in the Protocol on handover and takeover and within the maturity period pursuant to Article 5.4. of this Agreement calculated from the day of removal of the last defect or shortcoming.

5.4. The Seller's invoices shall be payable within 30 days after the day following the delivery of the respective invoice to the Purchaser's registered office. If the Seller applies the lien in compliance with this Agreement, the maturity period of the lien represents at most 30 days from the day of signing of the Protocol on handover and takeover.

5.5. The invoice delivery date shall be deemed the day when the invoice is delivered by a holder of a postal service licence or by a courier service to the Purchaser's registered office or the day of the invoice's personal delivery to the Purchaser's mail register.

5.6. The Seller's invoices must contain the essentials prescribed for tax and accounting documents and their form and contents must comply with the provisions of Act No. 563/1991 Coll., on Accounting, as amended, and Act No. 235/2004 Coll., on Value Added Tax, as amended, and must contain the essentials prescribed for business documents pursuant to Section 13a of Act No. 513/1991 Coll., the Commercial Code, as amended. The third invoice shall contain as an attachment the list of performed works and deliveries in the structure and with the pricing agreed with the Purchaser. The invoices shall contain in particular:

- specification of the accounting document and its serial number
- identification data of the Purchaser, including tax ID no.
- identification data of the Seller, including tax ID no.
- essentials prescribed for business documents
- description of the content of the accounting document
- date of issuance
- date of taxable transaction
- total amount of price, excluding tax
- tax rate
- total amount of tax rounded up in compliance with applicable regulations
- total amount of price, including tax
- signature of the Seller's responsible representative
- Annex

- list of performed works awarded according to an agreed way
- copy of the Protocol on handover and takeover with signature of person who took delivery for the Purchaser

If an invoice does not contain the above essentials, the Purchaser shall return it for correction without payment. In such a case, the payment term shall re-commence as of the delivery date of the corrected or newly issued invoice.

5.7. The Purchaser's financial obligation (debt) shall be deemed settled on the day when the amount owed is debited from the Purchaser's account.

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TERM OF PERFORMANCE

6.1 The initial term means the day of signing the Agreement. The Seller is obligated to start a delivery preparation to this term.

6.2 The completion term means the day in which the Seller informs the Purchaser in written he completed all work and deliveries necessary for the fulfilment of the obligations arising from the Agreement and call the Purchaser for takeover the delivery.

6.3 The date of handover and takeover means the day in which the Seller and the Purchaser sign the Protocol on handover and takeover.

6.4 The Seller agrees to properly manufacture, procure, test and supply the entire delivery to the Purchaser within 25 weeks of the date of execution of this Agreement (Date of handover and takeover).

6.5 The Seller's delay in properly completion of delivery and its handover is considered as material breach of the Agreement.

6.6 The Seller is entitled to complete the delivery before the agreed date of handover and takeover only with the consent of the Purchaser.

6.7 On Purchaser's call contracting parties may agree with gradually handover and takeover of delivery in comprehensive and fully function parts.

6.8 The date of handover and takeover may be extend appropriately:

a) If there is an interruption of the Seller's works on basis of the Purchaser's written instruction.

b) If there is an interruption of the Seller's works caused by circumstances excluding the liability (so-called force Majeure) in the meaning of Section 374 of the Commercial Code. The contracting parties have a duty to inform each other immediately about formation of such circumstance and they have a duty to agree on the method of its solving, in another case they can't invoke force Majeure.

The extension of delivery execution will be determine according to duration of obstacle or non-performance of the Purchaser's obligations agreed in this Agreement, considering the time which is necessary for restoration of works, providing that the Seller took all measures to reduce or avoid delay and after written agreement of parties.

6.9 Unless the parties agree otherwise, the Seller is entitled to perform installation of devices and their tests every working day in time from 8.00 am to 18.00 pm. In case of change of operating conditions the Purchaser is entitled to limit this time by written instruction to the Seller. In this case both parties shall arrange a change of date of handover and takeover in Appendix to the Agreement.

7

THE PLACE DETERMINED TO DELIVERY PERFORMANCE (THE STATION)

7.1 The place of performance is the room determined by the Purchaser no. A2/518, Technicka 2, 616 69 Brno for the first installation and University Campus VUT, Pod Palackeho vrchem for the second installation during the moving of device to the new premises.

7.2 The Purchaser is obligated to allow the initiation of installation and tests of devices by handover of demarcated area to the Seller (hereinafter "the Station") within three working days after receipt of Seller's written invitation, unless the parties agree with another date of handover of the Station. The Purchaser acquaints the Seller with follow information during handover of the Station:

a) permitted access roads to transport the goods to the place of performance,

b) connection points for devices supplied within delivery for the electric power distribution, distribution of heat, demineralized water, water, air condition or other media, when these energies or media are needed to the operation of devices, putting maximum allowable consumption in the individual consumption points,

c) operating rules.

The Seller may ask for this information before the Station handover – if he does so, the Purchaser communicates this information to him within 3 working days after he received his application.

8

OTHER TERMS FOR DELIVERY

Purchaser's instruction

8.1 The Sellers shall proceed independently during the execution of delivery. Nevertheless the Seller is obligated to respect all the Purchaser's instructions regarding to realization of delivery and warning of possible Seller's breaches of contractual obligations.

8.2 The Seller is obligated to warn the Purchaser of inappropriate nature of things taken from the Seller or instruction given by the Seller for the execution of delivery without undue delay, if the Seller could identify this inappropriate by professional care.

Used materials and products

8.3 The Seller is obligated to procure things needed for the execution of delivery, unless this Agreement explicitly stipulates that The Purchaser shall procure them.

8.4 The Seller is obligated to use only new (not previously used or reconditioned) components and materials. The Seller is obligated and guarantees he won't use any material which is known at the moment of its use as harmful or not corresponding with hygiene or ecological parameters during realization of delivery. As well as the Seller shall not use materials and supplies without required certification, if this certification is necessary for their use according to relevant regulations. If the Seller fails to fulfil these obligations he is

obligated to realize immediate rectification on Purchaser's written invitation and the Seller bears all associated costs.

8.5 If the Purchaser requests (but no later than the date of handover and takeover) the Seller submits a set of certificates of critical materials and supplies.

Installation

8.6 The Seller shall consult proposed connections and installations of devices with Purchaser during the preparation of delivery. The Seller shall submit proposed solution for approval by the Purchaser at the time allowing the completion of deliveries within the agreed time. The Seller shall not commence works at the Station before the approval of proposed solution by the Purchaser.

Control of the execution of delivery

8.7 The Purchaser is entitled to control the execution of delivery. The execution of delivery which is inconsistent with the Seller's obligations according to this Agreement will be considered as a material breach of the Agreement. If the Purchaser finds that the Seller executes the delivery inconsistently with his obligations, the Purchaser is entitled to demand removal of defects resulting from defective execution and to demand properly execution of delivery or the Purchaser is entitled to withdraw from the Agreement for the same reason.

Health and safety at work

8.8 The Seller is obligated to provide compliance with all security, hygiene and ecological measures and measures leading to fire protection of the executed delivery and objects in which the delivery is fulfilled to the extent and manner fixed by the relevant law.

8.9 The Seller is obligated to realize initial training on safety and health at work and on fire protection for all his employees working on the installation and testing delivery at the place of performance. The Seller is also obligated to renew and control the information of their employees on safety and health and on fire protection at work continuously.

8.10 The Seller is also obligated to provide realization of initial training on safety and health at work and on fire protection for his sub-supplier.

8.11 The Seller is fully liable for the health and safety of all persons who reside at the Station with his knowledge and he is obligated to provide their equipment by protective tools.

8.12 The Seller is obligated to realize own supervision and systematic inspection of safety at work and fire protection during the execution of delivery.

8.13 If there is an injury during the execution of delivery at the place of performance or during activities related to the execution of delivery at the place of performance, the Seller is obligated to provide investigation of the accident and writing the record. The Purchaser is obligated to provide necessary cooperation.

Damage

8.14 If the Seller activity caused damage to the Purchaser or to the third parties due to neglect, negligence or for non-compliance with requirements resulting from law, technical or other standards or resulting from this Agreement, the Seller is obligated to remove the damage without undue delay and if this is not possible, to pay the damage. The Seller bears all associated costs.

8.15 The Seller is also liable for damage caused by activity of those who execute the delivery for him.

4

The possibility to authorize another person to realization of the part of delivery

8.16 The Seller is entitled to authorize third person (sub-supplier) to the execution of part of delivery only with prior approval of the Purchaser. But in this case the Seller is liable for activity of the sub-supplier as he executes the delivery by himself.

8.17 The Seller is obligated to provide the fulfillment of all obligations resulting from the Agreement in his sub-contracts.

Putting in operation, handover and takeover of delivery

8.18 The Seller is obligated to notify in writing to the Purchaser no later than 3 working days in advance that delivery will be prepared to start the tests of devices consisting in normal operation of all supplied devices and facilities for at least 5 hours. During the tests the Seller shall verify (in the presence of the Purchaser) all functions of supplied devices and facilities including their control systems and performs control measurement which confirms the proper function of device and compliance with all the guaranteed parameters contained in the offer. Every malfunction of any supplied device, auxiliary facilities or control system leading to non-compliance with any parameters or any of characteristics of delivery required by tender documentation stop the tests and these tests are initiated from the beginning after removing breakdown. Successful completion of tests is a condition for handover and takeover of delivery. The Purchaser is obligated to initiate takeover immediately after successful completion of tests and to continue in that properly. The Seller is notably obligated to submit following documents for handover and takeover procedure:

a) list of devices which are part of delivery with their unit prices and quantities (according to individual rooms)
b) attests and certificates of products and materials used in delivery, declaration of conformity of all equipment with approved standards
c) reports of revision
d) reports of successful tests of the delivery including reports demonstrating compliance with all parameters and characteristics required by tender documentation of delivery
e) operations and maintenance manuals, conditions for maintenance and protection of device

Documents must be submitted in Czech language with the exception of point e) which can be submitted in Czech or English language. If the Seller submits required papers, the delivery is considered as properly completed and fit to handover.

8.19 The place of handover and takeover of delivery is the place of performance.

8.20 The Purchaser is entitled to invite other persons whose participation he considered as necessary to handover and takeover of delivery (e.g. future user of delivery).

8.21 The Purchaser and the Seller issue a written record (protocol) of process of handover and takeover.

8.22 Mandatory content of Protocol on handover and takeover of delivery represents:

a) details on the Seller, sub-contractors and the Purchaser

b) description of delivery which is the subject of handover and takeover

c) agreement on the manner and date of the evacuation of the Station

d) date from which the warranty period begins

e) the Purchaser's declaration whether the Purchaser accepts or does not accept the delivery

f) date of signature of Protocol on handover and takeover of delivery (this date is currently the taxable transaction date under the Value Added Tax Act)

8.23 Upon handover of the delivery, confirmed by the signature of the contact persons authorized by this Agreement hereunder on the Protocol on handover and takeover of delivery, the Purchaser assumes the risk of damage to the handed-over delivery; this fact shall not relieve the Seller from liability for damage caused as a consequence of defects of the delivery. The Seller bears the risk of damage to the delivery until the handover and takeover of the delivery.

8.24 The Purchaser is not obligated to take over the delivery, with defects and shortcomings even if the latter do not prevent the proper use of the delivery either alone or in combination with other defects and shortcomings. If the Purchaser does not exercise its right not to take over the delivery with defects and shortcomings, the Seller and the Purchaser shall make a list of ascertained defects and shortcomings in the Protocol on handover and takeover of delivery, including the manner of and deadline for their removal. If the Parties don't agree on the deadline for removal of defects in the Protocol on handover and takeover of delivery, it holds that the defects are to be removed within 5 working days of the date of handover and takeover of the delivery.

8.25 If the Seller notifies the Purchaser that the delivery is ready for handover and takeover and it is determined during the handover and takeover procedure that the delivery is not properly completed, the Seller is obligated to reimburse the Purchaser for any and all costs incurred by the Purchaser in relation to the unsuccessful handover and takeover procedure. The Seller also bears costs of organizing of repeated procedure.

9

Warranty

9.1 The Seller is liable for defects which the delivery has at the time of its handover, for defects found in the period between handover of the delivery to the Purchaser and the beginning of the warranty period, and for defects found during the warranty period. The warranty period for the delivery shall be 24 months.

9.2 The warranty period shall commence on the date of signature of Protocol on handover and takeover of the delivery by the Purchaser. However, if the delivery is taken over by the Purchaser with even a single defect or shortcoming, the warranty period shall commence on the date of removal of the last defect.

9.3 For the deliveries of devices that have their own warranty certificates, the warranty period shall have the duration set out in the certificate, but not less than set out in par. 9.1 of this Article hereof.

9.4 The Purchaser shall raise a claim for removal of a defect in the delivery, that is proved in the period between handover of the delivery to the Purchaser and the beginning of the warranty period or during the warranty period, against the Seller without undue delay after ascertaining the defects, but no later than on the last day of the warranty period, by means of a written notice sent to the Seller's authorized representative (by warranty claim). A claim sent by the Purchaser on the last day of the warranty period shall be deemed to be made in time. In the written claim of defects, the Purchaser shall describe the defect and the manner in which the defect is to be removed. The Purchaser is entitled to:

a) request that the defect be removed by repair if the defect can be removed by this manner

b) request that defect be removed by supply of new performance if the defect can be repaired

c) request an appropriate discount on the purchase price

The Purchaser is entitled to choose the manner of removing defect which suits him. In case that the same defect arises during the warranty period at least the third time or if more than five defects arises on the delivery during the warranty period, the Purchaser is entitled to request that the defects be removed by supply of a new performance or to withdraw from the Agreement, even if the last defect can be removed by repair.

9.5 The Seller is obligated to remove claimed defects of the delivery free of charge.

9.6 The Seller is obligated to send his service technician to remove the defects so that service technician must arrive to the device no later than 72 hours after the date of receipt of the warranty claim. Saturdays, Sundays and public holidays are not counted towards this time limit. In this context the Seller is obligated to have at least two qualified technicians authorized for the repair of all supplied devices. If the Seller's service technician does not remove claimed defect on this visit, the Seller is obligated to verify the claim, to notify to the Purchaser whether he recognize the warranty claim and agree date of removing the defect (date of removing the defect shall always be agreed in writing) within 4 working days after the date of receipt of the warranty claim. If the Seller fails to do that, it is considered that he would recognize the warranty claim and he would remove the defect within the period set out in par. 9.7 of the Agreement. In the event that the Seller don't recognize a claim, the Seller is obligated to remove the defect – in this case the Seller shall warn the Purchaser in written that due to non-recognition of the claim he will demand the reimbursement of removing the defect. If the Seller does not recognize the defect, the justification of the claim shall be verified through an expert report commissioned by the Purchaser. If the claim is found justified by the expert, the Seller also bears the costs of preparation of the expert report. In this case the Purchaser's right to removal of the defect free also shall arise by the date of receipt of the warranty claim. If it is proven that the Purchaser's claim was unjustified, the Purchaser is obligated to reimburse the Seller for purposefully and demonstrably incurred costs of removal of the defect.

9.7 Maximum term for removing of the defect is 30 working days after the date of receipt of the warranty claim, unless the Seller and the Purchaser agree otherwise. The Seller and the Purchaser shall write a record on removal of the claimed defect, in which they shall confirm that the defect has been removed. The warranty term shall be extended by the time that expires from the date of exercising the claim to the time of removal of the defect.

9.8 The Seller is not liable for the defects which were caused by using materials and things provided by the Purchaser and the Seller could not found their unsuitability either with all taken care or the Seller warned the Purchaser on that but the Purchaser insisted on their use in writing.

9.9 The warranty shall not apply to defects caused by unprofessional handling, incorrect or unsuitable maintenance, noncompliance with the manufactures' rules of operation and maintenance of equipment accepted by the Purchaser from the Seller upon handover (e.g. warranty certificates), or those of which the Seller advised the Purchaser in writing. The warranty shall also not apply to defects caused by gross negligence or intentional conduct.

9.10 Should the Seller fail to remove the defect within deadline agreed by the Parties or - if this deadline were not agreed – within the deadlines set out in par. 9.7 of the Agreement or should the Seller refuse to remove the defect, the Purchaser is entitled to remove the defect at its own expense and the Seller is obligated to reimburse the Purchaser for the costs of removal of the defect, within 21 days of the date when the claim of defect was raised in writing against the Seller. In case that the Seller shall not reimburse the costs of removal of the defect to the Purchaser, the Purchaser is entitled to use retention according to this Agreement to satisfaction of his claim. In cases when from the warranty conditions result that only authorized person can perform the warranty repairs or when non-authorized intervention is connected with

the loss of rights from the warranty, the Purchaser may remove the defect only by using the services of an authorized person.

10

Insurance

10.1 The Seller is obligated to procure liability insurance for damage caused during the performance of business activities at the latest to the date of takeover of the Station, covering possible damages caused during the realization of the delivery to the Purchaser or to the third persons. The Seller is obligated to maintain the mentioned insurance in force during realization of the delivery. The breach of this obligation is a material breach of the Agreement.

11

WARRANTY AND POST-WARRANTY SERVICE

11.1 During the warranty period, the Seller is obligated to perform all servicing of the device on which the Seller makes the validity of the warranty conditional, free of charge. Furthermore, during the warranty period, on request made by the Purchaser in writing, the Seller is obligated to perform a charge-free service inspection of all the supplied devices at least once a year, in which he perform basic service tasks, notably the adjustment of device.

11.2 The Seller shall be obligated, at least for a period of 5 years after the expiry of the last day of the warranty period, to ensure post-warranty paid service upon the Purchaser's request.

11.3 The Seller shall be obliged to perform preventive post-warranty service no later than within 30 working days after the Purchaser's written request, unless the Purchaser determines another period of time. The Seller shall be obliged to start removing any defects of the device within the framework of post-warranty service no later than within 4 days after the delivery of the Purchaser's request for the defect removal and to remove the defect no later than within 10 days after the Purchaser's request, unless the Purchaser determines a longer period of time.

12

CONTRACTUAL PENALTIES AND DAMAGE COMPENSATION

12.1 Should the Seller be in delay with the handover and takeover of the delivery compared to the period agreed herein, the Purchaser shall be entitled to charge a contractual penalty to the Seller amounting to 0.01% of the purchase price, including VAT, for each, even incomplete, day of delay.

12.2 In the event that the Seller fails to remove the defect or shortcoming listed in the Protocol on handover and takeover of delivery within term stated in this Protocol (or within 5 days from date of handover and takeover of the delivery, if there is no period of removing the defect or shortcoming in the Protocol of handover and takeover the delivery), the Purchaser is entitled to charge the Seller with a contractual penalty amounting to CZK 2.000 for each defect or shortcoming in respect of which the Seller is in delay in removal, for each, even incomplete, day of delay.

12.3 If the Seller fails to remove the defect complained within the agreed period or – if no specific period was agreed – within the period set out in Article 9.7 above, the Purchaser shall be entitled to charge the Seller with a contractual penalty amounting to CZK 500 for each defect complained about with the removal of which the Seller is in delay for each day of delay. If the Seller fails to remove the malfunction of device

arising within 5 years after the expiry of the warranty period in the agreed period (or within 10 working days from the day of the receipt of request for removal of the malfunction, unless the Purchaser and the Seller agreed on the another period), the Purchaser is entitled to charge the Seller a contractual penalty amounting to CZK 500 for each malfunction in respect of which the Seller is in delay in removal, for each day of delay.

12.4 If the Seller does not evacuate the Station in the agreed period, but no later than 5 days after the date of handover and takeover of the delivery, the Purchaser is entitled to charge the Seller a contractual penalty amounting to CZK 2000 for each, even incomplete, day of delay

12.5 Should the Purchaser be in delay with the payment of the Seller's invoices compared to the agreed payment date, the Seller shall be entitled to charge a default interest to the Purchaser amounting to 0,01% of the amount due for each, even incomplete, day of delay, unless the Purchaser proves that the delay was caused by delayed release of funds from the state budget.

12.6 The obliged party shall be obligated to pay the sanctions charged no later that within 14 days after the receipt of the respective bill.

12.7 The same period of time shall apply to the payment of default interest.

12.8 Payment of sanctions (contractual penalties) shall not affect the Purchaser's right to the compensation of damage suffered as a result of a breach of the Seller's obligations covered by the sanctions.

13

TERMINATION OF THE CONTRACTUAL RELATIONSHIP

13.1 The contractual relationship established by this Agreement may be terminated by fulfilment, by mutual agreement of the contracting parties, or by withdrawal.

13.2 The Purchaser shall be entitled to withdraw from this Agreement if:

a) the Seller commits a material breach of its obligations stipulated herein;

b) insolvency proceedings are held against the Seller's assets;

c) the Seller commits a non-material breach of its obligations stipulated herein and fails to remedy such breach within a period provided by the Purchaser;

d) the Seller fails to respect the Purchaser's instructions despite the Purchaser's written notice;

e) provision of funds intended to cover expenditures arising from realization of the Project is suspended or terminated, or the Provider determines that the expenditures incurred on the basis of this Agreement are ineligible.

13.3 Contracting parties agreed that partially preclude the application of Section 351 of the Commercial Code in the event of the Purchaser's withdrawal from the Agreement due to suspension or termination of provision of funds intended to cover expenditures arising from realization of the Project. In this case the Seller won't claim damages which arises him in this context.

13.4 The Seller shall be entitled to withdraw from this Agreement in the event of a material breach of the Purchaser's obligations stipulated herein.

13.5 The withdrawal from this Agreement shall become effective upon delivery of the withdrawal notice to the other contracting party.

14

CHANGES AND AMENDMENTS TO THE AGREEMENT

14.1 This Agreement may only be amended or supplemented by written amendments numbered in ascending order that must be marked as such and validly signed by both contracting parties.

14.2 If either of the contracting parties submits a proposal of an amendment to this Agreement, the other party shall be obliged to express its statement to the proposal within 15 days after the day following the proposal delivery.

14.3 The Seller shall be entitled to transfer its rights and obligations arising from this Agreement to the third party only with the Purchaser's prior written consent.

15

FINAL PROVISIONS

15.1 Under conditions of this Agreement, in accordance with the ordering party's instruction and by exercising all the necessary the Seller is obligated to:

a) archive all documents made for the performance of the public contract pursuant to this Agreement and to allow access to the documents for ordering party at any time during this period (to 31st December 2025). The ordering party is entitled to take over documents above free after the expiry of ten years from the end of the performance according to this Agreement.

b) as the obliged person pursuant to Section 2 Point e) of the Act No. 320/2011 Coll., on Financial Control in Public Administration, to interact on the exercising financial control, including to allow the access for the managing body of OP RDI also to these parts of the bids, Agreements and related documents, which are the subject of protection under the special legal regulations (e.g. trade secrets, classified information, if the legal requirements are met (e.g. Section 11 Point. c) and d), Section 12 Subsection 2 Point. f) of the Act No. 552/1991 Coll., on State Control).

c) to allow the control of the sub-contractors for the managing body of OP RDI in the Agreements with his sub-contractors.

15.2 The contracting parties have agreed pursuant to Section 262 of Act No. 513/1991 Coll., the Commercial Code, as amended (the Commercial Code), that the legal relations established hereby shall be governed by the provisions of the Commercial Code.

15.3 The following annexes shall constitute an integral part of this Agreement:

- Annex No. 1 - technical specification of the delivery,
- Annex No. 2 – itemized budget,

In the event of any discrepancies or contradictions between the wording of this Agreement and its annexes, the Agreement shall prevail. In the event of any discrepancies or contradictions between the wording of individual annexes hereto, the annex listed in the paragraph above shall prevail; it does not apply to Annex 3.

15.4 This Agreement has been executed in four counterparts, each having the force of the original. Each contracting party shall receive two counterparts.

15.5 The contracting parties hereby declare that they have read this Agreement before its signing and that they agree with its contents, that this Agreement constitutes the entire agreement between them and that it has not been concluded under duress or under conspicuously disadvantageous conditions, in witness whereof the contracting parties have attached their respective signatures hereunder.

4

In Brno

Date: 18. 1. 2013

Purchaser

---

prof. RNDr. Jaroslav Koča, DrSc.

Director of CEITEC MU

Masaryk University

MASARYKOVA UNIVERZITA
Středoevropský technologický institut
Kamenice 753/5, 625 00 Brno

14

In Katowice

Date: 2013-01-09

Seller

(signature) ---

(Name, surname) Andrzej Wiśniewski

(Position) company's owner

(Business name of the company) COMEF Science & Research Equipment

Andrzej Wiśniewski
właściciel firmy
COMEF
Aparatura Naukowo - Badawcza
40-719 Katowice, ul. Gdańska 2
Regon : P-270214335

Annex No. 1: Technical specification of the delivery

1) To the fulfillment of the obligations from the Agreement the Seller shall deliver, install, test (including submission of certificate of achievement of parameters for individual devices) and he putting into operation at least following devices:

Presentation of type designation of offered devices and individual adjustment of device types are included in a leaflet attached to this Annex 1

Fiji F200 Plasma ALD System		
Item	Qty	Description
Fiji F200	1	Includes: Chamber for wafer up to 8 inches, 500°C substrate heating, 4 heated precursor and 4 plasma gas lines, integrated vapor trap, substrate handling tool, H_2/O_2 safety interlock, laptop computer, 24 month warranty
ALD Booster	1	Carrier gas booster system for low vapour pressure precursor delivery.
Roughing pump	1	Dry Pump Edwards iGX100N*
Precursors	1	2 precursors TMA & TDMAH for site acceptance tests
Services		Installation, set-up and training (3-4 days) x2
Services	1	Move in service at customer site (loading dock to clean-room location and facilities hook up)
Shipping		Freight, insurance (incl. packaging/crating) DDP Customer Site

2) The delivery consisting of device according Point 1) shall have following technical, quality and functional properties:

An appropriate list with filled table according to Annex No. 1 to the Tender documentation (Technical conditions) and with related documents confirming the parameters according to contracting entity's requirements is attached to this Annex.

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The Seller declares that the delivery consisting of devices mentioned above will comply with all the Purchaser's requirements according to this Agreement. If there is a need to perform additional work or deliver another device to the fulfillment of the Purchaser requirements during the preparation and realization of delivery, the Seller is obligated to deliver this device and perform these works as part of his delivery without increasing the purchase price (mentioned deliveries and works shall not have character of more works.)

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The Seller's signature:

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16.04.2012

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Annex No. 2: **The purchase price – itemized budget**

Fiji F200 Plasma ALD System				
Item	Qty	Description	Each (CZK)	Total (CZK)
Fiji F200	1	Includes: Chamber for wafer up to 8 inches, 500°C substrate heating, 4 heated precursor and 4 plasma gas lines, integrated vapor trap, substrate handling tool, H_2/O_2 safety interlock, laptop computer, 24 month warranty	4 316 000,00	4 316 000,00
ALD Booster	1	Carrier gas booster system for low vapour pressure precursor delivery.	133 000,00	133 000,00
Roughing pump	1	Dry Pump Edwards iGX100N*	481 000,00	481 000,00
Precursors	1	2 precursors TMA & TDMAH for site acceptance tests	285 000,00	285 000,00
Services		Installation, set-up and training (3-4 days) x2	57 000,00	57 000,00
Services	1	Move in service at customer site (loading dock to clean-room location and facilities hook up)	114 000,00	114 000,00
Shipping		Freight, insurance (incl. packaging/crating) DDP Customer Site	114 000,00	114 000,00
		TOTAL PRICE		**5 500 000,00**
		VAT exception due to Section 22 Subsection 1 point 2 of Polish VAT Regulations – delivery with installation within EU, VAT will be settled locally		**np.**
		TOTAL GROSS PRICE		**5 500 000,00**

The price is in CZK currency and is determined with consideration of the price developments in the given field, including the developments of the Czech currency exchange rate towards foreign currency until the completion of the public contract performance. Including all necessary costs for proper performance of the subject of the public contract, including all associated costs (fees, customs duty, incidental costs, etc.).

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The Seller's signature:

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Andrzej Wiśniewski
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40-719 Katowice, ul. Gdańska 2
Regon P-270214335
16.04.2012

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Appendix 1 - Technical Specification		
Type designation of the instrument		
Plasma Atomic System for Depositionmodel Fiji F200		
Basic requirements of the contracting authority		
It's required delivery system for atomic layer deposition (ALD) Al2O3, AlN, TiO 2, TiN, MgO, HfO2, La2O3, Nb2O5, Ta2O5 on various substrates (silicon wafers 200 mm in diameter, smaller samples, samples with greater height) for the project CEITEC MU .		
The required technical and functional characteristics	**Requirement**	**Offer** *(applicants shall meet the required parameter verifiable manner, for example, specific reference to technical data sheets, drawings etc.)*
Compatibility with class 1000 clean room.	yes	yes
Capability to deposit thin films of Al_2O_3, TiO_2, TiN (or AlN), MgO, HfO_2, La_2O_3, Nb_2O_5, Ta_2O_5 proven by experimental results and detailed process recipes.	yes	yes
Thermal and plasma mode of operation, process temperature range up 400 °C.	yes	yes
Plasma option includes RF generator, matching unit, reaction chamber and all other necessary requirements and equipment, integrated in one compact system.	yes	yes
The offered ALD system can be operated in both plasma and thermal mode without any significant hardware changes.	yes	yes

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Plasma chamber is protected from conductive deposits if metals would be deposited in thermal ALD mode. This can be done by a separating gate valve or a nitrogen gas flow.	yes	yes
Process support based on at least two years period experience and free of charge process support during system lifetime.	yes	yes
System is delivered including the precursors (full containers) necessary for thermal and plasma Al_2O_3 and HfO_2 deposit. (TMA, TEMAHf or TDMA-Hf, H_2O, plasma - O_2) for acceptance tests.	yes	yes
Mass flow controlled carrier gas line (N_2).	yes	yes
It should be possible to use prepacked precursors from third companies as well as to change and refill the precursors by the instrument operator.	yes	yes
3 precursor lines installed for thermal ALD mode with possible extension up to 5 total at least. 2 sources for high vapor pressure chemicals (liquid), 1 heated source for low vapor pressure chemicals (solid/liquid) – heated at least up to 200 °C	yes	yes
At least 3 precursor lines installed for plasma enhanced ALD mode.	yes	yes
The precursor lines system includes precursor containers (stainless steel, 50 ml volume at least), pulsing valves (computer controlled) and any necessary equipment,	yes	yes
It should be possible to change the precursor containers in a safe and easy way without exposure of precursor to ambient conditions.	yes	yes
Precursor containers are temperature stabilized.	yes	yes
Vacuum system includes dry vacuum pump and necessary housing	yes	yes
Precursor trap in front of the pump to protect it from deterioration and to increase lifetime.	yes	yes
System should be able to handle wafers up to 200 mm as well as small pieces with different shapes (e.g. 15x15x6 mm).	yes	yes

System is ready for possible future installation of load-lock (200 mm wafers) with turbo pump.	yes	yes
Software for process control and evaluation (including computer or control unit and all the necessary licenses).	yes	yes
System is controlled with a single software application capable of controlling and monitoring both plasma and thermal processes, as well as deposition conditions, precursor temperatures etc.	yes	yes
Software controlled recipe for purging the precursor line and container after installation of a new one.	yes	yes
The system must contain an interface (preferably USB) to transfer the data (process details) to a common PC in a format usable in data analyzing software (*.txt, *.dat, Microsoft Excel, Microcal Origin etc.).	yes	yes
Software allows to use different classes of users, password encrypted.	yes	yes
The system is fully interlocked against risky situations to prevent operator, machine and environment from any damage.	yes	yes

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18.04.2012 .....

Signature of the person authorized to act on behalf or for the contractor

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Regon : P-270214335

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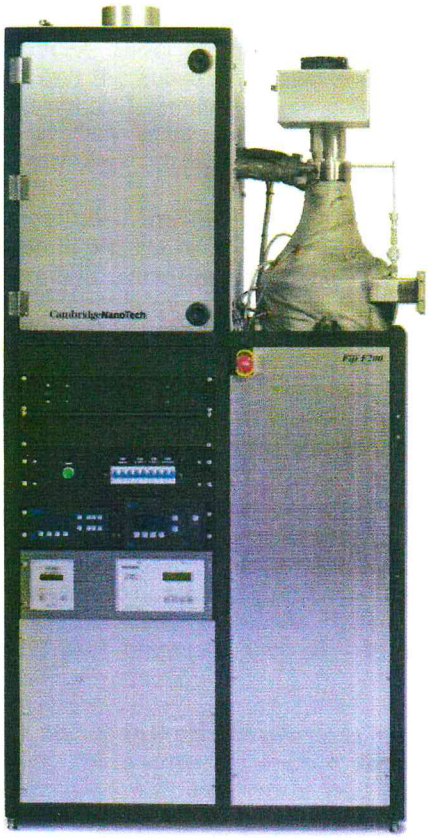
COMEF
SCIENCE & RESEARCH EQUIPMENT

Project reg.number CZ.1.05/1.1.00/02.0068

Contracting Entity :

MASARYK UNIVERSITY
public university
Žerotínovo náměsti 9, 601 77 Brno
Czech Republic

Fiji F200 Plasma ALD System



2 Gdanska str.PL40-719 Katowice, Poland
tel.+ 48.32.203 41 49 fax.+48.32.203 58 23 ext.30 , e-mail : comef @comef.com.pl
www.comef.com.pl , VAT ID : PL6340080768

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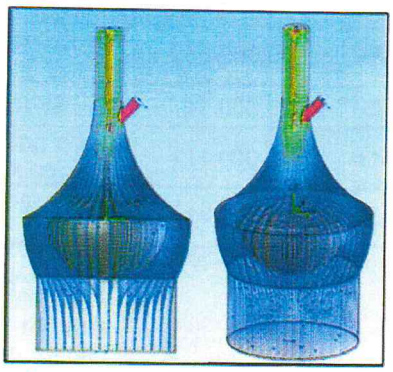
ATESTACJA KOPII DOKUMENTÓW

Fiji Plasma ALD System
TECHNICAL DESCRIPTION, PRICE CALCULATION AND TRADE CONDITIONS

Fiji F200 Plasma ALD System Overview

The Cambridge NanoTech Fiji F200 plasma systems are modular high-vacuum ALD systems that accommodate a wide range of deposition modes while using a flexible system architecture that permits multiple configurations of precursors and plasma gases. The result is a next generation plasma ALD system that reproduces thermal and plasma-enhanced ALD films reported in the literature, as well as providing the necessary experimental flexibility for future ALD innovations.

Cambridge NanoTech has combined its leading ALD expertise with advanced Computational Fluid Dynamics (CFD) analyses to optimize the Fiji F200 ALD reactor, heater and trap geometry. The reactor geometry combined with the substrate heater creates a laminar flow of precursor gases and remote plasma generated radicals. This optimizes deposition uniformity while minimizes cycle/purge times and precursor use.



Computational Flow Analysis

Cambridge NanoTech has designed the Fiji pulsed Inductively Coupled Plasma (ICP) source to provide excellent film uniformity with minimal substrate damage while requiring no special cleaning procedures. The Fiji generates plasma in the remote ICP source outside of the reaction chamber, protecting the substrate from damage, unlike Direct Coupled plasma ALD systems, which subject the substrate to energetic ion bombardment by generating plasma inside of the reaction chamber. The ICP source, like the precursor inputs, has a constant gas flow to prevent cross coating in the supply lines.

Cambridge NanoTech is proud to offer to customer the compact Fiji F200, which provides the most experimental flexibility of any plasma ALD system on the market. The Fiji F200 accommodates up to 8" substrates and is designed for pulsed or plasma gas flows. The ICP can be used for substrate pretreatment (substrate clean, surface modification), ALD films, and post treatment such as nitridation and doping-annealing cycles.

With up to 6 precursor inputs and up to 6 plasma gas ports the Fiji F200 has the most inputs available. Its modular architecture allows the Fiji F200 to be configured or retrofitted with an optional load lock and/or turbo pumps. Additionally, the Fiji F200 is easily configured with an integrated ALD Booster™ option for low vapor pressure precursors.

All Fiji systems are uniquely designed to deposit on high aspect ratio structures and have an integrated patent-pending ALD Shield™ vapor trap that protects pumps and pump lines from harmful deposits.

Fiji F200

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Fiji F200 Plasma ALD System

Configuration :

Item	Qty	Description	Each (CZK)	Total (CZK)
Fiji F200	1	Includes: Chamber for wafer up to 8 inches, 500°C substrate heating, 4 heated precursor and 4 plasma gas lines, integrated vapor trap, substrate handling tool, H_2/O_2 safety interlock, laptop computer, 24 month warranty	4 316 000,00	4 316 000,00
ALD Booster	1	Carrier gas booster system for low vapour pressure precursor delivery.	133 000,00	133 000,00
Roughing pump	1	Dry Pump Edwards iGX100N*	481 000,00	481 000,00
Precursors	1	2 precursors TMA & TDMAH for site acceptance tests	285 000,00	285 000,00
Services		Installation, set-up and training (3-4 days) x2	57 000,00	57 000,00
Services	1	Move in service at customer site (loading dock to clean-room location and facilities hook up)	114 000,00	114 000,00
Shipping		Freight, insurance (incl. packaging/crating) DDP Customer Site	114 000,00	114 000,00
		TOTAL PRICE	**5 500 000,00**	**5 500 000,00**
		VAT exception due to Section 22 Subsection 1 point 2 of Polish VAT Regulations – delivery with installation within EU, VAT will be settled locally	**0,00**	**0,00**
		TOTAL GROSS PRICE	**5 500 000,00**	**5 500 000,00**

The price is in CZK currency and is determined with consideration of the price developments in the given field, including the developments of the Czech currency exchange rate towards foreign currency until the completion of the public contract performance. Includes all necessary costs for proper performance of the subject of the public contract, including all associated costs (fees, customs duty, incidental costs, etc.).

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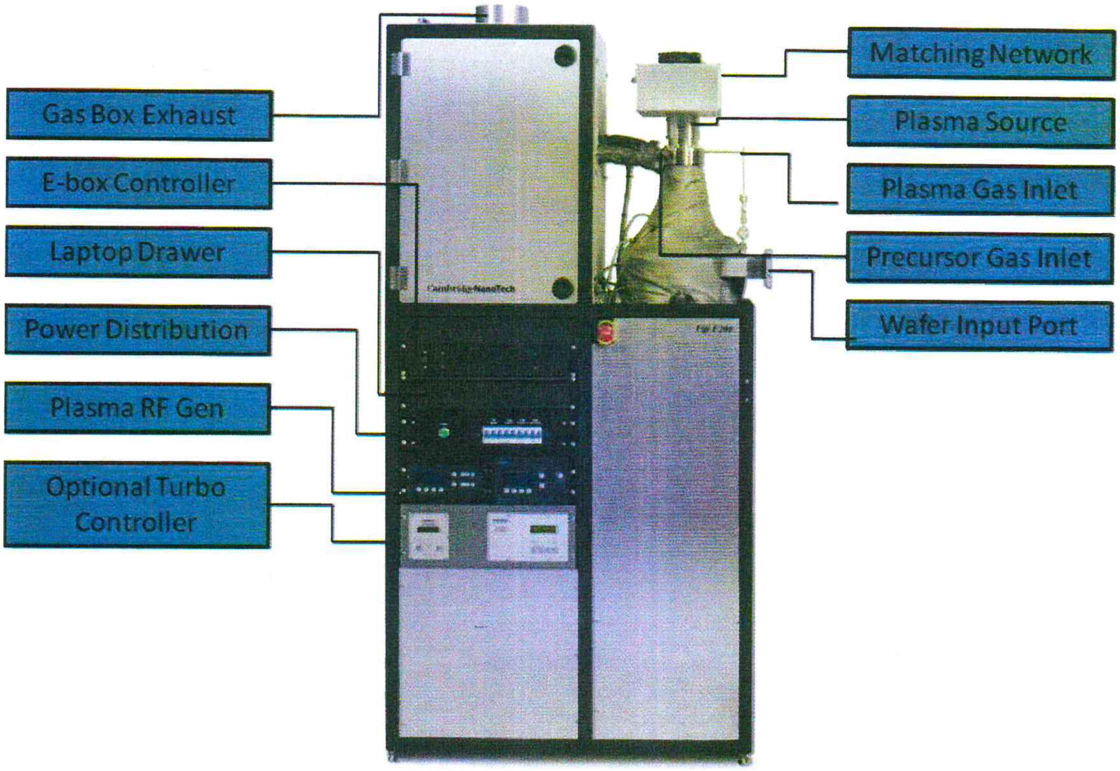
Fiji ALD System Components



System Overview

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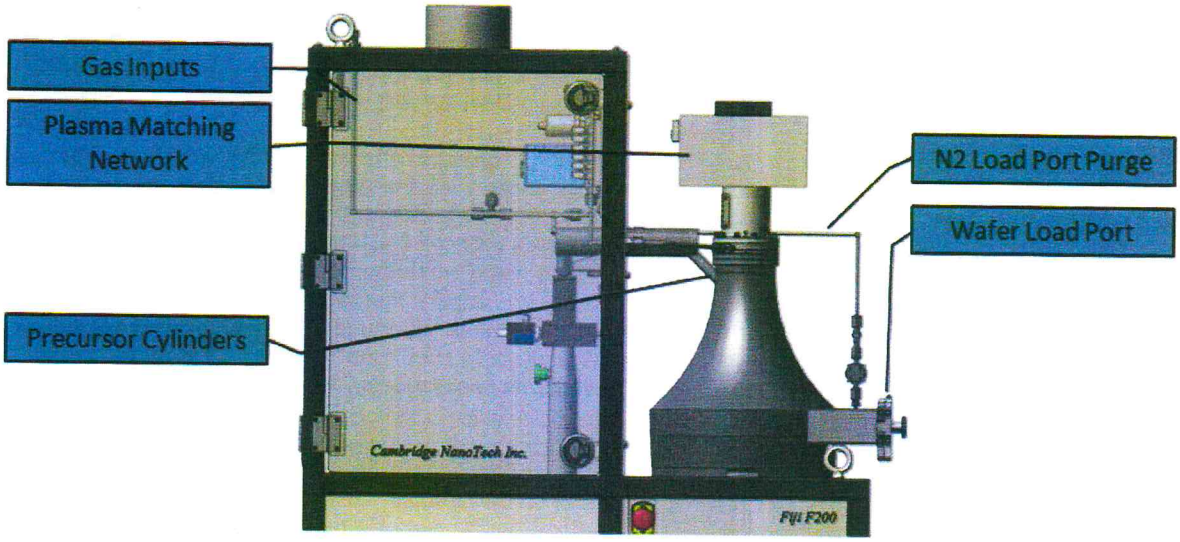
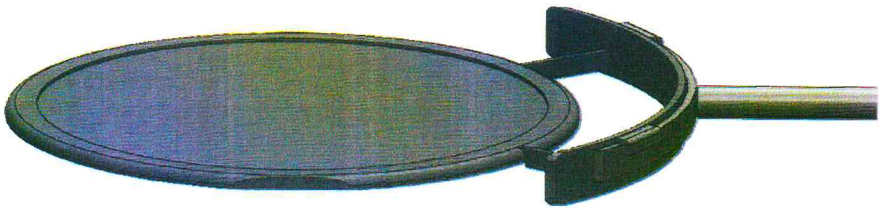


Gas Cabinet



Sample Transport Tool

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Fiji Standard Specifications

ALD System Overview

Flow-optimized ALD chamber for thermal or plasma deposition; protected from conductive deposits if metals would be deposited in thermal ALD mode. This can be done by a separating gate valve or a nitrogen gas flow.
Top mounted precursor and gas delivery
Deposition uniformity of Al_2O_3 is 1.5% (1σ) on 200 mm substrate.
Capability to deposit thin films of Al2O3, TiO2, TiN (or AlN), MgO, HfO2, La2O3, Nb2O5, Ta2O5 proven by experimental results and detailed process recipes. System is delivered including the precursors (full containers) necessary for thermal and plasma Al2O3 and HfO2 deposit. (TMA, TEMAHf or TDMA-Hf, H2O, plasma - O2) for acceptance tests.
Integrated ALD Shield™ vapor trap (keeps all pumping line components clean)
Process Modes: Thermal Continuous Mode for high speed depositions, Thermal Expo Mode with stop valve operation for ultra-high aspect ratio structures (>450:1), and Plasma Mode for difficult nitrides and metals

Vacuum system and gauging of ALD chamber

Vacuum gauge for process monitoring and control
Edwards iGX 100M dry pump
System is ready for possible future installation of load-lock (200 mm wafers) with turbo pump

Sample holder

Includes gate valve shield

Precursor and gas delivery

Large vented gas cabinet with ample space for additional precursor cylinders.
Four (4) lines standard, up to 6 lines available per reactor. Each line accommodates solid, liquid and gas precursors and is independently heated up to 200°C.
Precursor cylinders are rapid exchange 50 cc with pulsing valve (computer controlled) and necessary equipment
Four (4) plasma gas lines standard, up to 6 lines available per reactor.
One (1) carrier gas mass flow controller (Ar (or N_2 for thermal processing) 0-200 SCCM).
ICP remote plasma radical generator (<1 msec turn on/off time) with tuner, RF power supply, matching unit and software interfacing
Thermal and plasma mode of operation, process temperature range up to 400°C.
The offered ALD system can be operated in both plasma and thermal mode without any significant hardware changes.

Cabinet

Welded steel framework
Removable aluminum panels
Integrated 19 inch electronics rack
Internal space for dry roughing pump

Computer control software

- Main

  Intuitive LabVIEW™ based control software and graphical user interface (GUI)
  Windows laptop based
  USB interface to ALD control electronics allowing a transfer the data (process details) to a common PC in a format usable in data analyzing software (*.txt, *.dat, Microsoft Excel, Microcal Origin
  < 1 hour learning curve

  Recipes

  Intuitive recipe building with load and save capabilities
  Sample recipes that demonstrate various ALD modes included

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Deposition

Easily deposit single layers and complex laminate structures
Automatic data logging
All system parameters can be controlled in recipe (e.g. substrate and precursor temperatures, gas mass flows, pulse times, etc)
Graphing of precursor pulses versus time

Built in safety features

H_2/O_2 safety interlock
Software safety interlocks
Overpressure abort
Faulty recipe entry warnings
Continuous USB communication monitoring
Software allows to use different classes of users, password encrypted

Thermal Heating

Manual or recipe control of all heaters

Electronics

Lenovo Thinkpad or equivalent with Windows
Electronics control box (e-box) with safety features
Many spare I/O for additional equipment control

Power distribution

Requires single 200 – 240 VAC 50/60 HZ 1ph Drop
Additional 208 3ph or 380 – 400 3ph for dry pump
Multiple emergency off (EMO) switches
Safety interlocks

Warranty

24 month standard with remote process support within warranty
5 years of post guarantee service

Delivery, terms

Delivery time: no later than 5 months after the date of signing the contract

Validation of the offer

3 months, starting on the day following the expiry of the deadline for the bids submission

System installation and training

on-site installation of the device, which will be taken place in two stages – first, to the existing place of laboratory no. A2/518, Technicka 2, Brno 616 69 and subsequently the device will be moved to the final area at the University Campus VUT, Pod Palackeho vrchem (assumption is the beginning of the year 2014) ; test after the installation in the contracting entity's laboratory: layer with a thickness of 30nm on 150mm silicon plate, tolerance in thickness calculated with 1σ (Termal Al2O3 <1.5%, Plasma Al2O3 <5%, Termal HfO2 <5%);
on-site training for 3 persons
instructions for use and service and maintenance manuals in English language

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CambridgeNanoTech
Simply ALD

Fiji Series

Fiji plasma atomic layer deposition (ALD) systems are designed for optimal performance and versatility for both thermal and plasma ALD deposition. Cambridge NanoTech is the leading provider of ALD solutions for research and industry worldwide, delivering expert services and versatile turnkey systems in a compact, economical package.

Performance

Designed to yield optimal uniformity and throughput for all deposition materials, the Fiji excels in thermal and plasma ALD processes, offering precise and digitally controlled ultra thin coatings.

- Optimized reactor and heater chuck shapes result in laminar flow that increases deposition uniformity while minimizing precursor use and cycle times.
- Interactive software and highly customizable experimental parameters allow rapid setup and execution of experiments with easy analysis of resulting data.
- Proprietary precursor delivery system with the optional ALD Booster™ for low vapor pressure precursors yields excellent film quality over the widest range of precursors.
- Three deposition modes allow precise control of deposition process including Exposure Mode™ for ultrahigh aspect ratio features (up to 2,000:1 aspect ratio), Continuous Mode™ for rapid growth of conformal films, and Plasma Mode™ for difficult nitrides and metals.

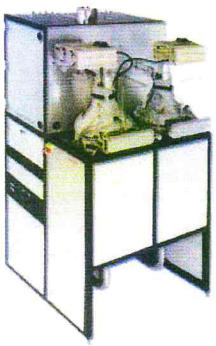
Versatility

Fiji is the most flexible system available for ALD research, featuring a modular design and many options that are customizable to meet your exact needs.

- Optional dual chamber configuration lets you run separate and independent experiments simultaneously.

F200 with load lock

- Optional 1000 °C wafer chuck and turbo pump options provide the largest experimental envelope for ALD research.
- Includes up to six independent precursor lines for solid, liquid, or gas chemistries and up to six plasma gas lines for maximum utility.
- Optional load lock available with or without turbo pump and your choice of a motorized or manual translation arm.
- Open architecture and modular design provide easy and flexible configuration and upgrades over the life of the Fiji.
- Easy integration of ellipsometry and other in-situ film metrology methods.



F202 system

Premium Value

The Fiji's breakthrough system design delivers unrivaled performance without compromise, within the budgets of most researchers.

- Simplified design captures the sophisticated processes of thermal and plasma ALD in an economical package.
- Our integrated ALD Shield™ allows excess reactive vapors to form a film before they reach the pumping system, preventing build-up of deposits on the plumbing and in the pump. This saves money in maintenance costs and prevents excess gases from being exhausted to the environment.
- Reduced operating costs and simplified maintenance made possible by lowest precursor consumption, fully integrated ALD Shield vapor trap, off-the-shelf replacement parts, and continuous flow inside plasma source.

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AKCELERUDA NAUKOWO-BADAWCZA

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System Specifications	
Substrate size	200 mm
Dimensions (w x d x h)	F200: 1075 x 570 x 2130 mm F202: 1075 x 1140 x 2130 mm Load lock with transfer arm: 1360 x 560 x 1500 mm
Cabinet	Stainless steel frame, removable aluminum panels, adjustable feet, optional fab interface
Deposition Modes	High speed or ultra-high aspect ratio
Operational Modes	Continuous Mode™, Exposure Mode™, Plasma Mode™
Power	115 VAC or 220 VAC, 4500 W per reactor
Control	Labview™, USB, Windows™ PC
Substrate Temperature	500 °C (optional 1000 °C)
Deposition Uniformity	<±1%
Vacuum Pump	Optional integrated dry pump and optional turbo pump
Compatibility	Cleanroom class 100 compatible, but not required
Compliance	CE, FCC, and CSA
Options	In-situ ellipsometry, liquid injection
Precursor Specifications	
Precursor Delivery System	4 heated lines standard, up to 6 lines available, metal VCR seals, heated up to 200 °C
Valves	High speed pneumatic pulse valves (15 msec) with continuous purge
Precursor Cylinders	Individually heated up to 250 °C 50 ml stainless steel cylinders
Carrier/Venting Gas	N_2 or Ar mass flow controlled, 20-200 SCCM
Options	ALD Booster™ for low vapor pressure precursors, high temperature ALD valves (>200 °C), N_2 assist, liquid injection, hydrogen/oxygen safety interlock

ALD Films

At the forefront of ALD precursor and ALD thin film research, Cambridge NanoTech scientists continuously add to the list of standard ALD recipes:

- Oxides: Al_2O_3, HfO_2, La_2O_3, SiO_2, TiO_2, ZnO, ZrO_2, Ta_2O_5, In_2O_3, SnO_2, ITO, Fe_2O_3, MnO_x, Nb_2O_5
- Nitrides: WN, Hf_3N_4, Zr_3N_4 AlN, TiN
- Metals: Ru, Pt, W, Ni, Fe, Co

These films, their nanolaminates, and many more materials and their recipes are available from Cambridge NanoTech's own staff, its partnerships, and its 150+ customer base.

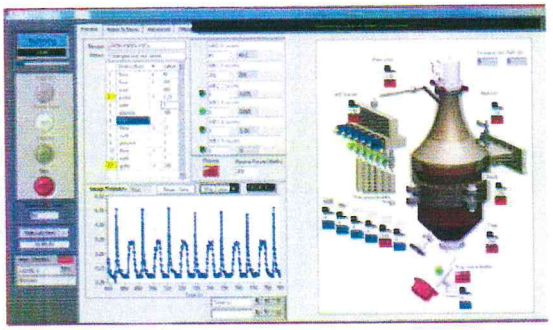
- Included first year support provided by our ALD experts for recipe development, film characterization, research collaboration, and applications support.
- ALD recipes developed by our researchers are readily available in pre-packaged precursors available from our chemical partners, Strem Chemicals, Inc. and Sigma-Aldrich, Inc.

Flow-Optimized Chamber Design

A breakthrough in ALD system design, Fiji has the only chamber available today specifically designed for both plasma and thermal deposition. Our experts have performed comprehensive computational flow analyses and have engineered the optimal chamber shape and geometry to ensure even flow distribution over the substrate surface. The result is a uniquely shaped chamber that yields laminar flow, maximum radical efficiency, and uniform depositions.

LabVIEW™ Software

Control all key system parameters from substrate temperature to precursor dose with our LabVIEW-based software that is powerful, yet simple to learn and use. The LabVIEW program is easily expandable with our LabVIEW source code, provided for complete programmatic flexibility.



Glovebox Integration

The Fiji is readily integrated with MBraun™ gloveboxes for handling thin film samples in an advanced inert atmosphere system that is free of oxygen and moisture.

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Simply ALD

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