



भौतिकी संस्थान
भुवनेश्वर
Institute of Physics
Bhubaneswar - 751005, India

(परमाणु ऊर्जा विभाग, भारत सरकार का एक स्वायत्त अनुसंधान संस्थान)
(An autonomous research institution of Dept. of Atomic Energy, Govt. of India)

संख्या No. 1831 /IP,

दिनांक Dated: 23/03/2020

The list giving details of percentage of departments with UGC-SAP, CAS, DST-FIST, DBT, ICSSR and other recognitions by national and international agencies in respect of Institute of Physics, Bhubaneswar, a Constituent Institution/ Off Campus Centre of HBNI is enclosed herewith.

(आर. के. रथ R. K. Rath)
रजिस्ट्रार REGISTRAR

रजिस्ट्रार/REGISTRAR
भौतिकी संस्थान/INSTITUTE OF PHYSICS
भुवनेश्वर/BHUBANESWAR

संलग्नक Encl: यथोपरि As above

सेवामें To,

श्रीमति भारती सुवर्णा Smt. Bharati Suvarna
सहायक कुलसचिव Assistant Registrar,
एचबीएनआई, मुंबई HBNI, Mumbai.

डा. घ.- सैनिक स्कूल, भुवनेश्वर - 751 005, भारत
P.O.: SAINIK SCHOOL, BHUBANESWAR - 751 005, INDIA

दूरभाष/Phone : 0674-2300637, 2301058, 2301823, फैक्स/Fax : 0674-2300142, वेब/Web : <http://www.iopb.res.in>

हमेशा हिंदी में पत्र व्यवहार करके देश का गौरव बढ़ाएं

| Name of the Scheme/project/ Endowments/ Chairs | Name of the Principal Investigator/ Co Investigator (if applicable) | Name of the Funding agency | Type (Government/Non- Government) | Department | Year of Award | Funds provided (INR in lakhs) | Duration of the project |
|--|--|---|--------------------------------------|-------------------|---------------|-------------------------------|-------------------------|
| Fabrication of High Pure Alumina and its uses as Antireflection Coatings in Solar Cell | Dr. P. V. Satyam | National Aluminium Company Limited (NALCO), India | Non-Government | Physical Sciences | 2018-2019 | 21.14 | 2 Years |



रजिस्ट्रार/REGISTRAR
भौतिकी संस्थान/INSTITUTE OF PHYSICS
भुवनेश्वर/BHUBANESWAR

WORK ORDER

Ref No: NBC/R&D/68/01/ 1224

Date: 20-09-2018

To,

The Director,
Institute of Physics,
Bhubaneswar- 751013.

Sub: Work Order on "High pure Nano-Alumina for solar cell anti- reflection coatings and reinforcing aluminium"

Ref: Your project proposal submitted to NALCO dated 09-11-2017

Dear Sir,

With reference to the subject of project proposal submitted to NALCO and subsequent clarification, we are pleased to issue this Work Order in accordance with agreed terms and conditions as set out below.

The work order incorporating the complete technical specifications and other conditions, which also forms part of this work order, no variation of any nature shall be permitted to those conditions of this work order except with the prior written consent of NALCO.

Whereas Institute of Physics (herein after called IOP), Bhubaneswar along with its collaborative agencies IMMT, Bhubaneswar and IIT Bhubaneswar have agreed for undertaking a Collaborative R&D Project on "*High pure Nano-Alumina for solar cell anti-reflection coatings and reinforcing aluminium*". However, IOP, Bhubaneswar shall be nodal agency and responsible for implementation of this project as per the terms and condition of this work order. All correspondences, including payments shall be done with IOP, Bhubaneswar.

1. Project Title:

High pure Nano-Alumina for solar cell anti- reflection coatings and reinforcing aluminium.

2. Objective: To develop High pure Nano-Alumina for use in solar cell anti- reflection coatings and reinforcing aluminium

3. Scope of work:

- i. To develop new technologies for industrially adaptable and cost effective production of high purity alumina (HPA) nano-powder films using laser ablation and chemical routes.
- ii. Use of the nano-HPA powder films as antireflection coatings in Solar Cells and other glasses.

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नेशनल एल्युमिनियम कम्पनी लिमिटेड National Aluminium Company Limited
(भारत सरकार का उद्यम) (A Government of India Enterprise)

निगम कार्यालय

CORPORATE OFFICE

नालको भवन, नयापल्ली, भुवनेश्वर-751 061, भारत

NALCO BHAVAN, Nayapalli, Bhubaneswar-751 061, INDIA

फोन Phone: (EPABX) (0674) 2301988, 2301999, 2300013, 2300976, 2301550, 2303233

फैक्स Fax: (0674) 2301290, 2300580, 2300740, 2300640 & 2300246

वेबसाइट Website: www.nalcoindia.com

4. Methodology:

- i) Laser Ablation technique for preparation of HPA nano-powder thin films:
 - a. The laser will interact with the Aluminium kept in DI water / vacuum / ambient / ethanol solution and evaporation or plasma formation will occur.
 - b. Evaporated particles will collide with other and form the powder.
 - c. The size of the particles will be controlled by using different laser energies.
- ii) Using Aluminium Scrap using Oxidation and regulated furnace annealing to make HPA.
 - a. Oxidation of scrap In KOH solution around 300°C.
 - b. Heated in Muffle furnace at 1100°C to form Al(OH)₃
 - c. Vacuum Annealing at 1750°C to produce Al₂O₃ by this high purity α- Al₂O₃ can obtain
- iii) Characterisation: Various techniques; X-ray diffraction, scanning electron microscopy (SEM), tunnelling electron microscopy (TEM), Mass spectroscopy and anti-reflection and thermal conductivity measurements.

5. Project Cost:

Rs 49, 87,500/- (Rupees is forty nine lakh eighty seven thousand five hundred rupees only) is required to carry out the project excluding GST. The indicative cost break-up is given below.

| Activities | Amount, Rs-Lakh- |
|---|--------------------|
| Equipment and Machinery support, Raw materials | 6.0 |
| Experiments, Testing and Documentation | 4.0 |
| Manpower- Research Fellow, Project Asst/ Research Professionals etc.(outsourcing) | 23.6 |
| Conveyance, tours and travels | 4.4 |
| Misc and Contingency | 5.0 |
| Institute Overheads | 6.875 |
| Total | 49.875 +GST |

6. Payment Terms:

Payment on submission of invoice in compliance to GST rule indicating NALCO GSTN: 21AAACN7449MIZ9 shall be released in phases as given below.

| Sl No | Payment Schedule | % of Payment |
|-------|--|--------------|
| 1 | On signing and acceptance of work order and submission of endorsement letter from collaborative Institute/Agency along with activity schedule of the project | 40 |
| 2 | After completion of one year and submission of report | 30 |
| 3 | On submission of final report and upon acceptance of the same by NALCO | 30 |

7. **Duration of the project:** Twenty four (24) months from zero date.

8. **Zero date of the project:** Zero date of the project will be the date of release of 1st instalment of the project money by NALCO.

9. Taxes and Duties:

Tax at the prevailing rate is to be paid by NALCO extra. Applicable Income Tax @ prevailing rate will be deducted at source.

- i) For the purpose of this Special Condition of Contract (SCC), the term "tax" in addition to tax imposed under CGST (Central Tax)/SGST (State Tax)/IGST (Integrated Tax)/UTGST (Union Territory Tax)/ GST Compensation Cess Acts, also includes any duties, cess or statutory levies levied by central or state authorities.
- ii) Rate variation in Taxes and any new promulgated taxes after last date of the submission of price bid only on the goods and/or services applicable to invoices raised on NALCO within the contractual delivery date /period (including extension approved if any) shall be on NALCO's Account against submission of documentary evidence.
- iii) Further, in case of delay in delivery of goods and/or services, any upward rate variation in Taxes and any new promulgated taxes imposed after the contractual delivery date shall be to the M/s IOP's Account.
- iv) It would be the responsibility of the M/s IOP to get the registration with the respective Tax authorities under provision of GST. Any taxes being charged by the M/s IOPs would be claimed by issuing proper TAX Invoice in a GSTN (Goods & Services Tax Network) acceptable format indicating details elements of all taxes charged and necessary requirements as prescribed under the respective tax laws and also to mention his correct and valid GSTN number along with NALCO's GSTN number as applicable for particular supply on all invoices raised on NALCO under GST Regime.
- v) M/s IOP would be liable to reimburse or make good of any loss/claim by NALCO towards tax credit rejected /disallowed by any tax authorities due to non-deposit of taxes or non updation of the data in GSTIN network or non-filing of returns or non-compliance of tax laws by the M/s IOP by issuance of suitable credit note to NALCO. In case, M/s IOP does not issues credit note to NALCO, NALCO would be constrained to recover the amount including interest payable along with Statutory levy/Tax, if any, payable on such recovery.
- vi) Tax element on any Debit Note / Supplementary invoice, raised by the M/s IOP will be reimbursed by NALCO as long as the same is within the permissible time limit as per the respective taxation laws and also permissible under the Contract terms and conditions. M/s IOP's to ensure that such debit Notes are uploaded while filing the statutory returns as may be prescribed from time to time.
- vii) M/s IOP will be under obligation for quoting/charging correct rate of tax as prescribed under the respective Tax Laws. Further the M/s IOP shall avail and pass on benefits of all exemptions/concessions/benefits/waiver or any other benefits of similar nature or kind available under the Tax Laws. In no case, differential Tax Claims due to wrong classification of goods and/or services or understanding of law or rules or regulations or any other reasons of similar nature shall be entertained by NALCO.
- viii) In case, NALCO's Input Tax Credit (ITC) is rejected on account of wrong levy of tax i.e. payment of Integrated Tax in place of Central Tax+ State/Union Territory Tax or vice versa, the M/s IOP is liable to make good the loss suffered by NALCO by issuance of suitable credit note to NALCO. In case, M/s IOP does not issue credit note

- to NALCO, NALCO would be constrained to recover the amount including interest payable along with Statutory levy, if any, payable on such recovery.
- ix) NALCO shall reimburse GST levied as per invoice issued by the M/s IOP as prescribed under section 31 of the CGST Act and respective states and Rules.
 - x) To enable NALCO to avail ITC, the M/s IOP/supplier shall furnish/submit any and all certificates, documents and declarations as are required by NALCO to avail of the ITC with respect to GST reimbursed by NALCO on materials sold to NALCO.
 - xi) The HSN Code under which the goods/service will fall should be clearly mentioned along with the Rate at the time of submission of invoice for releasing payment.
 - xii) In case, NALCO is not able to take Input Tax Credit due to any noncompliance/default/negligence of the seller, the same shall be recovered from the pending bills/dues (including security deposit, BG etc.).
 - xiii) Seller shall be responsible to indemnify NALCO for any loss, direct or implied, accrued to NALCO on account of supplier's failure to discharge his statutory liabilities like paying taxes on time, filing appropriate returns within the prescribed time etc.
 - xiv) Any benefit by way of reduction in rate of tax or increase in input tax credit arising due to introduction of GST shall be passed on to NALCO through reduction in supply value by way of commensurate reduction in Bill value.

10. Obligation of NALCO: NALCO shall provide required samples of Aluminium and Alumina available with Nalco free of cost to IOP for the project work.

11. Obligation of IOP, Bhubaneswar:

- i) To complete the work as per schedule and within the stipulated time frame. IOP, Bhubaneswar, has to work in close association with NALCO's R&D personnel and pass on all information and findings to NALCO regularly by Monthly Progress Report which may include photographs / videos of the experimental / project work in the last week of every month i.e. before 25th of each month.
- ii) Investigative efforts will not be limited to the scope of work as brought out under the activities to be undertaken at IOP, Bhubaneswar but by adopting all techniques available at IOP, Bhubaneswar to achieve the overall objective of the project.
- iii) IOP, Bhubaneswar shall maintain complete and total confidentiality about all the Information, results, findings, processes etc. in the project and shall not reveal, divulge or publish, any or all information without express written consent of NALCO.
- iv) IOP, Bhubaneswar has to perform the project as per the objective, scope & methodology outlined in this proposal.
- v) IOP, Bhubaneswar has to demonstrate at least one batch (experiment), the findings of investigations concerning the project to NALCO's R&D personnel. In case, the findings of above demonstration test is not as per mutually agreed results as specified in the Project Proposal, IOP, Bhubaneswar will arrange another batch demonstration test to establish the findings without any additional financial claim to NALCO. However, in case, the results of the 2nd batch of demonstration test are also unsatisfactory, IOP, Bhubaneswar will discuss with NALCO to settle the matter amicably.

- vi) On completion of detailed investigation, Draft Final Reports shall be submitted by IOP, Bhubaneswar to NALCO at least two months before of schedule date of completion. NALCO will give comment within one month of receipt of the draft final report. IOP, Bhubaneswar will prepare the Final Report after inclusion of NALCO's comments on the Draft Report, if any, and submit 4 copies of the Final Report for NALCO's acceptance and necessary records and use in the company.
- vii) Utilization certificate to be submitted to NALCO.
- viii) Sample collection, Packing, Loading, Transportation and un-loading of all samples or any other requirements to be arranged and borne by IOP, Bhubaneswar.
- ix) IOP shall make their own arrangements including travel, boarding and lodging for their visit to NALCO for the project work.

12. Deliverables:

- i) High pure alumina powders (target purity 99.99%) are expected: technologies would be developed Al as source materials.
- ii) Application for anti-reflection coating would be established.
- iii) Coating for screens would be developed.
- iv) Validate with scientific backups and derive optimum process and conditions at laboratory scale
- v) IPR and Publications with Report.

13. Confidentiality:

- i) During the tenure of this Work Order IOP, Bhubaneswar and NALCO undertake on their behalf and on behalf of their Sub-contractors/employees/representatives/associates/successors to maintain strict confidentiality pertaining to the Scope of Work under this Work Order for any purposes other than in any accordance with this Work Order.
- ii) IOP, Bhubaneswar shall not disclose the test results/ know-how and/or process developed under this Work Order to any third party or person for a period of 10 years from the date of commencement of Work Order without prior written permission from NALCO.
- iii) Similarly NALCO shall not disclose the test results/ know-how and/or process developed under this Work Order to any third party or person for a period of 10 years from the date of commencement of Work Order without prior written permission from IOP.

14. Termination:

- i) Notwithstanding the provisions of the Work Order, this Work Order may be terminated by either party in the event that the other party has committed any breach of any material provision herein contained and failed to rectify such breach within 60 days after affected party has given a written notice of such breach and of the possibility of termination of the Work Order by reason thereof.
- ii) If the Government of India or any statutory authority empowered to do so, decides/directs to terminate the Work Order, both parties will immediately discuss and agree for the liabilities and obligation of each party arising from such termination.

- iii) NALCO shall have the right to terminate the Work Order by giving 60 days' notice without assigning any reasons therefore.

15. Effect of Termination:

Termination of the Work Order shall not affect;

- i) NALCO's obligation to make payments which have become due prior to the termination of the Work Order, after all due adjustments.
- ii) All works done by IOP, Bhubaneswar under the scope of the project till the date of termination shall become the property of NALCO and IOP, Bhubaneswar shall be bound to hand over all the documents and materials to NALCO before claiming any payment as per (i) above and NALCO reserves its rights to utilize the same for development and research works and also reserves rights to utilize the services of any other agencies for the same.

16. Force Majeure:

Neither IOP, Bhubaneswar nor NALCO shall be considered in default in performance of their obligations, if such performance is prevented or delayed because of war, hostilities, revolutions, civil commotion, strike, lockout, epidemic, fire, wind/storm, flood, earthquake, because of any law and order proclamation, regulation or ordinance of any Government or because of any Act of God, or for any other cause beyond the reasonable control of the party affected, provided notice of any such cause with necessary evidence by which the obligation under this Work Order is thereby affected or prevented or delayed is given within 14 days from the happening of the event, and in case it is not possible to serve notice within the said 14 days period then, within the shortest possible period without delay.

As soon as the cause of Force Majeure has been removed, the party whose ability to perform its obligations have been affected shall notify the other of such cessation and inform the other party of such notice of the actual delay incurred in such affected activity. An event which is Force Majeure wheresoever's it occurs, provided that it prevents, affects or delays the parties in performing contractual obligations, will justify the affected party's claim of Force Majeure. Should one or both parties be prevented from fulfilling contractual obligations by a state of Force Majeure lasting a continuous period of six months, either party has the right to terminate the Work Order. However, prior to deciding on termination, the parties shall consult each other and decide regarding the future performance of the Work Order.

17. Arbitration:

In case of any dispute or difference arising out of the work order, which cannot be resolved mutually between client and IOP, Bhubaneswar, it shall be referred to a sole Arbitrator to be appointed by the CMD, NALCO. The CMD, NALCO shall communicate/ cause to communicate, a panel of three names of persons to IOP, Bhubaneswar in this regard within 30 (thirty) days of notice of arbitration from IOP, Bhubaneswar to select anyone of them to be appointed as the Arbitrator. In case IOP, Bhubaneswar has not communicated its selection as above within thirty days of receipt of communication from NALCO, CMD, NALCO will appoint any one of them as the Sole Arbitrator. During the Arbitral proceedings the fees and expenses fixed by the Arbitral tribunal shall be deposited in equal

shares by both the parties which will be subject to the final award as to costs and as to the liabilities for costs in the award. However, in the arbitral proceeding if either party fails to deposit its share of the fees and expenses or deposit the said party will not be entitled to participate in the arbitration proceeding. The Arbitrator shall give a reasoned and speaking award. The award of the Arbitrator shall be binding on both the parties. The venue of arbitration shall be at Bhubaneswar. In case of any vacancy another Arbitrator will be appointed in the same manner as above. The Arbitration and conciliation Act 1996 as amended by the Arbitration and Conciliation (Amendment) Act, 2015 or any statutory modification or re-enactment thereof and the rules made there shall be applicable to this agreement.

18. Jurisdiction:

This Work Order shall be governed and construed in accordance with the laws applicable in India subject to exclusive jurisdiction of Courts of Bhubaneswar (Orissa) only.

19. First Use Right:

NALCO will have the "First Right" to use the technology/know-how/knowledge developed under the present Joint Research Project (JRP). After commercialization by NALCO, the sharing of revenue out of the project is to be decided mutually through separate terms & condition or agreement.

20. Third Party Licensing:

NALCO shall make all efforts to commercialize the process developed in this project. For this purpose, a separate agreement shall be signed between IOP, Bhubaneswar and NALCO, if required.

Intellectual Property generated out of this collaborative R&D may be licensed/ marketed by IOP, Bhubaneswar to third party only after taking permission from NALCO on a mutually agreed terms and condition.

21. Intellectual Property Protection:

Any Intellectual Property Rights (Patents/Design/Trade Mark/Copy Right) obtained by the Parties hereto pertaining to collaborative R&D prior to signing of the agreement shall remain the property of that Party. The other Party shall have the right to commercially exploit/use the Intellectual Property on mutually agreed terms.

IOP, Bhubaneswar, NALCO and collaborating agencies of IOP, Bhubaneswar shall endeavour to protect the Intellectual property of the know-how/process by filing patents/publishing research outputs etc. The associated Scientists, Engineers and Technologists of the organizations will be named as the true and first inventors of the process know-how.

The successful outcome of the project efforts with respect to development of process technology, if found suitable for filing of patent(s), then in such a case the patent has to be filed by IOP in the name of NALCO & IOP, Bhubaneswar as the applicant, with names of all associated investigators from all the collaborating agencies. The Patenting expenditure will be equally shared by NALCO & IOP, Bhubaneswar.

22. Other Conditions:


- i) In case, NALCO decides to use either fully or in part the results, findings, processes etc. of this project for its own use, NALCO shall not be obliged to pay any fees, royalties or any more payment to IOP, Bhubaneswar. However IOP, Bhubaneswar will not use either fully or part the know-how/ process developed without permission of NALCO.
- ii) In case of any reason whatsoever, IOP, Bhubaneswar fails to initiate the research activities at all within a period of two months of acceptance of this WO, the entire fund should be refunded by IOP, Bhubaneswar to NALCO without any prejudice. In case the research work stops permanently for any reason, the unspent amount should be refunded by IOP, Bhubaneswar to NALCO.
- iii) The Scientists/ Engineers both from NALCO and IOP, Bhubaneswar will jointly review the progress half yearly either at NALCO or at IOP, Bhubaneswar or by communication. On termination of the Project, no further payment will be made to IOP, Bhubaneswar for the balance period and IOP, Bhubaneswar to submit Fund Utilization Certificate for funds released so far.
- iv) All communications concerning the project activities may be addressed to the concerned executive, in this project to GM(R&D), Corporate Office at NALCO Bhavan ,P-1, Nayapali, Bhubaneswar-751013.

23. Confirmation of Work Order:

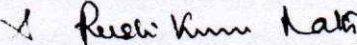
We are forwarding herewith the Work Order in duplicate. One copy is to be returned duly signed, stamped and dated, to as under, in token of your acceptance, within 10 days of receipt of this Work Order.

Thanking you,

Yours faithfully,
For & on behalf of National Aluminium Company Limited


(Subrat Kar)
General Manager (R&D)

We accept the Work Order and its entire content
For & on behalf of IOP, Bhubaneswar.



Signature and Seal

Witness Name & Address:

रेजिस्ट्रार/REGISTRAR
भौतिकी संस्थान/INSTITUTE OF PHYSICS
भुवनेश्वर/BHUBANESWAR