



# भारतीय निर्देशक द्रव्य



## BHARATIYA NIRDESHAK DRAVYA (INDIAN REFERENCE MATERIALS)



*BND®* ....

*Ensuring the Quality for Aatmnirbhar Bharat*

# BND<sup>®</sup>

‘Quality Assurance of Products  
for Barrier Free Global Trades’

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## *Foreword*



The National Physical Laboratory, India (NPLI), a constituent laboratory under Council of Scientific and Industrial Research (CSIR), was established on January 4, 1947. In 1956, the Legal Metrology Act entrusted NPLI to establish a measurement foundation of the country at par with international ones and to create and implement the programs needed for inclusive growth of the nation and the quality of life. In 1956, NPLI also became a permanent member of International Bureau of Weights and Measure (BIPM), France.

I am happy that the NPL is carrying out the original mandate of CSIR on maintenance of national physical standards and certified reference materials (under a trademark of Bharatiya Nirdeshak Dravya, BND). The availability of BND will ensure that quality of products made in India are of international standards.

Dr. Shekhar C. Mande  
Director General,  
Council for Science and Industrial Research

## *Foreword*



The international trade demands that the products are manufactured under quality systems with established measurement traceability to SI units through the National Metrology Institutes (NMI). In India, NPL provides the measurement traceability through the calibration of equipment using its national/primary standards and Bharatiya Nirvesha Dravya (BND<sup>®</sup>). BNDs are well-characterized using state-of-the-art measurement methods for the determination of chemical composition and/or physical properties. BNDs ensure the accuracy and reliability of measurements that are required for controlling the quality of products developed by industry, for new discoveries in science, innovation and technology, for monitoring the environment and for better health and safety of citizens in India. NPLI has produced >70 BNDs in association with various Reference Material Producers in the country and looking forward to produce BNDs for all the requirements of India as well as for the world.

Dr. D K Aswal  
Director  
CSIR- National Physical Laboratory

## *Foreword*



CSIR-NPL has been one of the most important pillars in the Quality Infrastructure of the country. Its role as the NMI (National Measurement Institute), along with rules governing legal metrology, is well recognized. The initiative taken by CSIR-NPL, to strengthen the legal metrology as an important component of quality assurance through indigenously developed Indian Reference materials (RM) i.e. Bharatiya Nirdeshak Dravya is commendable. BNDs will play a crucial role in reducing the dependence of CRMs imported from foreign countries at much higher cost thus increasing cost of testing and calibration traceable to SI units ensuring the quality of products in every manufacturing & consumer sector by providing traceable measurements and enhancing quality of life of citizens through metrology. Through BND program, CSIR-NPL has put in motion the ecosystem of precise measurement which will provide credence to quality of Indian made products.

I am sure that this initiative will go a long way in promoting the concept of “**Aatmnirbhar Bharat**” as well as lend a resounding confidence to “**Vocal for Local**”.

We at QCI are committed to move forward hand-in-hand with this initiative of CSIR-NPL to make India a self-reliant nation where quality of products for our own market or the world market is never compromised.

My best wishes for a bright and successful future of BND.

Ravi P Singh  
Secretary General  
Quality Council of India (QCI)

## *Foreword*



Certified reference materials (BNDs) are essential for quality assurance of life in terms of calibration, quality control, and method validation, assignment of values to other materials and to establish measurement traceability to SI units. On the occasion of World Metrology Day (WMD) celebration on 20th May 2020 CSIR-NPL has released the coffee table book on BND. It summarizes details of the BNDs developed by CSIR-NPL in association with Reference Materials Producers (RMPs).

As on today India imports CRMs worth more than Rs 10,000 crore. It is a primary responsibility of National Measurement Institute of India (NPL) to come forward towards import substitution and become Aatmanirbhar Bharat (self-reliant) in BND production. To cater the needs of Indian/global market, CSIR-NPL has started its mission mode program in association with Ministry of Commerce and Industry (MoC) with Line Ministry (S&T) for the indigenous production of BNDs. I am glad to say that CSIR-NPL has released so far 72 BNDs.

I wish to express my thanks to the Director NPL, MoC, QCI, RMPs, and members of the subcommittee on reference materials in this endeavour.

Dr. R P Pant  
Head, BND

## *Foreword*



It's an immense pleasure to write words about Bharatiya Nirdeshak Dravya (BND) program of CSIR-NPL which is an immediate response towards the clarion call of our Hon'ble Prime Minister Shri Narendra Modi towards making a **self-reliant** India. I deeply believe that NABL and NPL through their coordinated activities can achieve India's 21 century dreams of becoming self-reliant in producing Certified Reference Materials (CRMs). Reference materials (RMs) and CRMs are widely used for the calibration of measuring apparatus, evaluation of measurement procedures, quality control of measurements and laboratories; also, play a crucial role in National and International standardizing activities.

Currently, India is majorly dependent on imported CRMs. A common national program i.e. BND for producing CRMs under the umbrella of National Measurement Institute (NMI) of India is a great initiative taken by National Physical Laboratory (NPL). This initiative by NPL will not only promote the CRMs produced in India but will also save precious foreign exchange, generate employment and boost our economy.

Best wishes for the success of this initiative.

N. Venkateswaran,  
Chief Executive Officer  
National Accreditation Board for testing and calibration Laboratories (NABL)



Release of Chemical BNDs by Hon'ble Dr. Harsh Vardhan, S&T Minister, Government of India; Dr. D. K. Aswal, Director, CSIR-NPL; Professor A. K. Grover, Research Council Chairman, CSIR- NPL & Former VC – Punjab University and other dignitaries.



On the occasion of Metrology day, release of 28 petroleum BNDs (bench-mark for BS VI fuels) by Hon'ble Dr. R. Chidambaram, former principal scientific advisor to Government of India; Dr. Shekhar S. Mande, DG- CSIR & Secretary- DSIR, Govt. of India; Dr. D. K. Aswal, Director, CSIR-NPL; Professor A. K. Grover, Research Council Chairman, CSIR- NPL & Former VC – Punjab University and other dignitaries.

# Preamble

A rapid transition of India from developing state to developed state requires strengthening of its quality infrastructure and manufacturing, for which availability of indigenous standards and certified reference materials (CRMs) are pivotal.

The national metrological institutes of advanced economies (e.g. USA, Germany, Japan France, UK, Korea, China) are having very strong program on reference material production whereas, the reference material development program in India is still in infancy.

Major industries in India depends on the other National Measurement Institutes (NMIs) for International System of Units (SI) traceable testing & calibration and CRMs resulting in depletion of foreign reserve.

Specifically, the CRMs are being procured at very high cost; India is exporting CRMs worth INR1000 Crore/annum approximately. *This poses a dire need to take a step forward for indigenous development of CRMs* which will contribute to save the import cost, enhance the export and thereby GDP of the country by many-folds, reinforcing the **“Make in India”** and **“Self-reliance”** pledge of Govt. of India.

CSIR-National Physical Laboratory has taken a lead for the production of Indian Reference Material registered trademark as Bharatiya Nirdeshak Dravya (BND) in association with ministry of commerce and industries for **self-reliant India**.



# Bharatiya Nirdeshak Dravya (BND®)

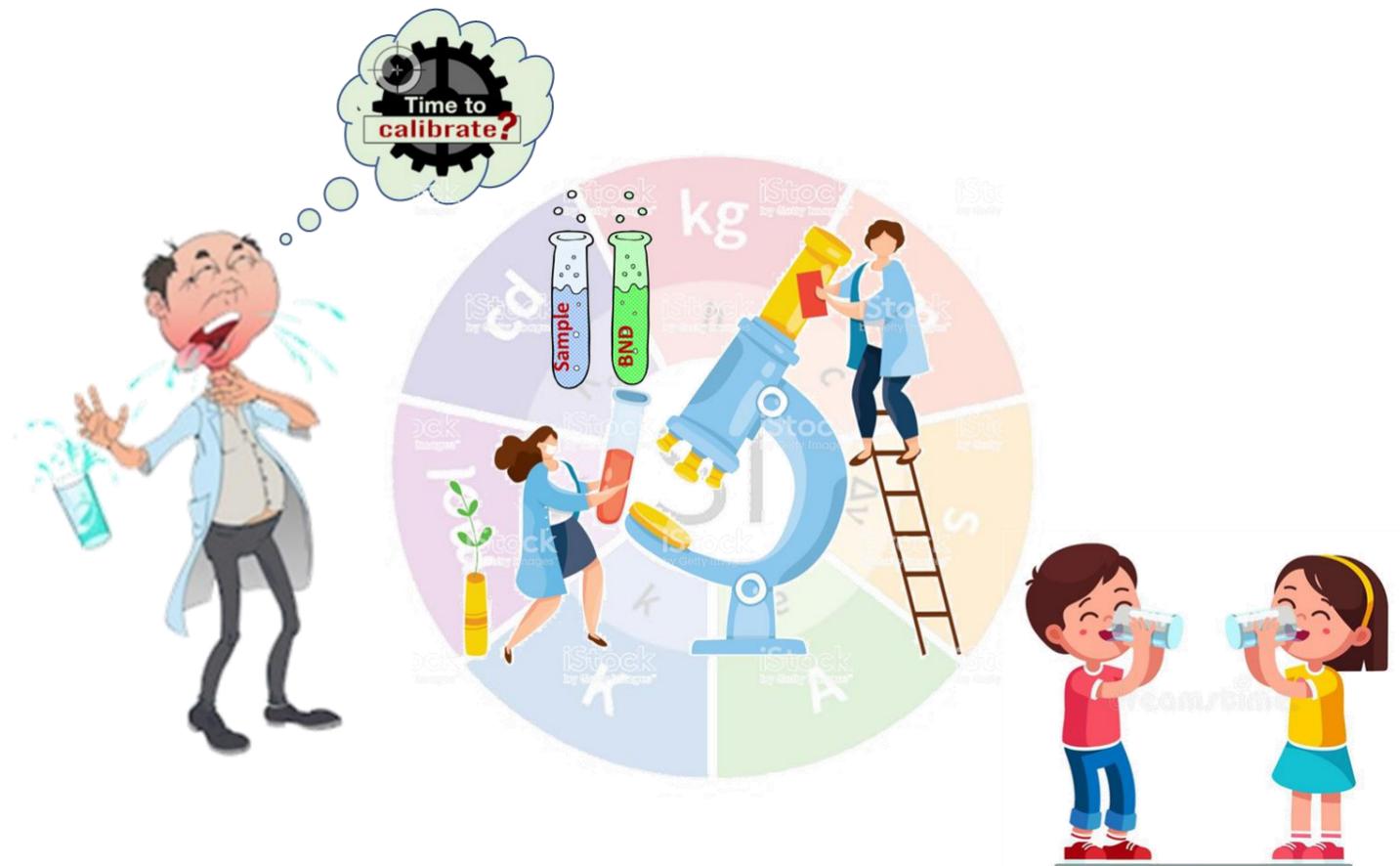


Bharatiya Nirdeshak Dravyas (BNDs) i.e. Indian reference materials are CRMs developed by CSIR-NPL. BND activity at CSIR-NPL has recently been reinforced aiming to bring a paradigm shift in socio-economic fabric of the country through quality control assurance for export, import and domestic consumer products in every sector and versatile job creation.

The availability of BNDs is poised to enhance the national quality infrastructure and equip the quality regulatory bodies of almost all the ministries of Government of India.

CSIR-NPL is developing BNDs by its own and in collaboration with specific reference material producers (RMPs) following the stringent conditions of ISO17025 and ISO 17034 & 35.

**To date, 72 BNDs are available in the market with continuous effort to enhance the number. The developed BNDs are also being exported to different economies.**





# Reference Material Producer



**Company Name:** CSIR-National Physical Laboratory

**Address:** Dr K. S. Krishnan Marg

**Email:** headbnd@nplindia.org

**Telephone:** +91-11-45608373

**Weblink:** [www.nplindia.in](http://www.nplindia.in)

**Link to Order:** <http://www.nplindia.in/centre-calibration-testing-cfct>



# BND<sup>®</sup> 2001

## *α-Alumina Powder*



**PURPOSE:** BND<sup>®</sup> 2001, consists of an 'Alumina powder' (corundum structure), is an internal standard for intensity calibration of powder X-ray diffractometer (XRD).

**INDUSTRIAL DEMAND/MARKET:** XRD is one of the most widely used equipment for structural analysis of the materials and is required both in academia and industry. For quality and accurate data collection, routine calibration of XRD is required, indicating significant demand of reference materials i.e. BND 2001.

**POTENTIAL USERS:** Educational Institutions (All universities and Colleges), Mining Industries, Pharmaceutical Sector

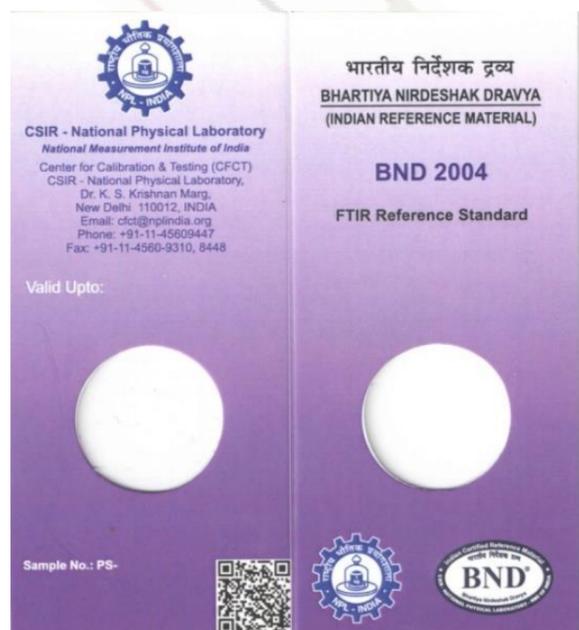
**ANNUAL SALE:** 50-100 Units

**SOCIETAL IMPACT:** Availability of indigenously developed BND will indirectly contribute to the upliftment of the societal status.



# BND<sup>®</sup> 2004

## FTIR REFERENCE STANDARD



**PURPOSE:** BND<sup>®</sup> 2004 is meant for the calibration of Fourier Transform Infrared (FTIR) Spectrometer which is being routinely used in chemical and pharmaceutical industry.

**INDUSTRIAL DEMAND/MARKET:** India is importing more than 5000 FTIR calibration standards per year.

**POTENTIAL USERS:** Chemical, analytical, pharmaceutical and biomedical industries, calibration and testing laboratories etc

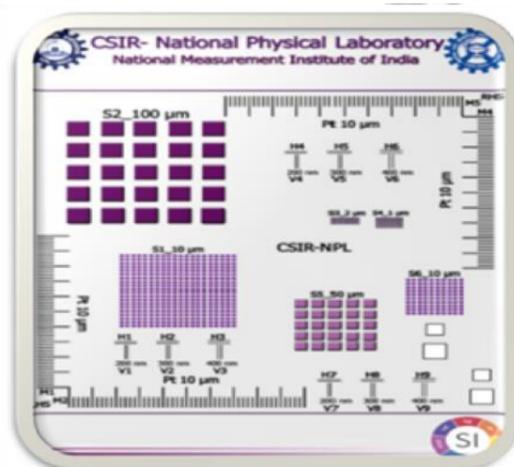
**NPL ANNUAL SALE:** 100 Units

**SOCIETAL IMPACT:** Availability of indigenously developed BND will enhance the quality of products, export and



# BND<sup>®</sup> 2009

## SemCali ARRAY



Schematics of SemCali Array

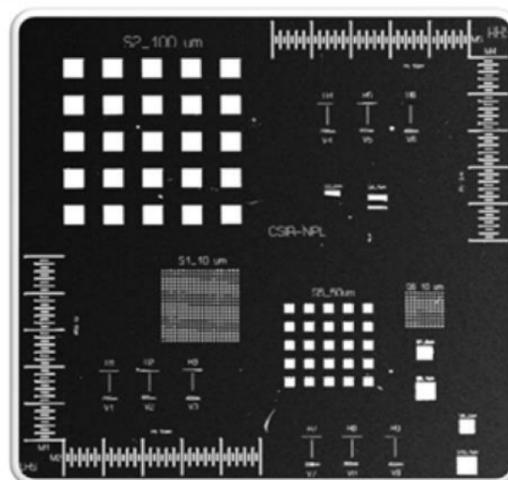


Fig: FESEM Image of SemCali Array

**PURPOSE:** BND<sup>®</sup> 2009 is a reference material for calibration of Magnification and Resolution of scanning electron microscopes (SEM and FESEM).

### INDUSTRIAL DEMAND/MARKET:

More than 2500 units/ 2 years are being imported.

**POTENTIAL USERS:** Research institutes, National labs and universities, industries like Bruker, Zeiss, Hitachi, Pharmaceutical companies, Mitutoya Asia Pacific, Moserbaer, Jeol, NTMDT, Asylum Research, WITec, Vistec etc. need nanodimensional artefacts with traceability certificate.

**ANNUAL SALE:** 200 units

**SOCIETAL IMPACT:** Availability of indigenously developed BND will indirectly contribute to the upliftment of the societal status.



# Reference Material Producer



**Company Name:** National Council for Cement and Building Materials

**Address:** 34 Km Stone, Delhi-Mathura Road (NH-2), Ballabgarh – 121004, Haryana, India

**Email:** ncb.cqc@gmail.com, cqcb@ncbindia.com

**Telephone:** 0129-4192239, 4192305, 4192222

**Weblink:** [www.ncbindia.com](http://www.ncbindia.com)

**Link to Order:** [https://www.ncbindia.com/wp-content/uploads/PT\\_Schemes/RateList-CRMsBNDfor2019-20.pdf](https://www.ncbindia.com/wp-content/uploads/PT_Schemes/RateList-CRMsBNDfor2019-20.pdf)



# National Council for Cement and Building Materials



## *Foreword*



The cement industry today, rated as one of the best performing industries across various sectors is pivotal in realizing the dreams of a “New India” by supporting infrastructure development, real estate and many flagship schemes of the Indian Government like Housing for All, 100 Smart cities, World-class Cement Concrete Highways, Dedicated Freight Corridors.

National Council for Cement and Building Materials (NCB), a premier Research, Development and Innovation institution is equipped with multi-disciplinary expertise coupled with state-of-the-art testing and evaluation facilities. NCB is the premier body under the administrative control of Ministry of Commerce and Industry, Govt. of India, for technology development, transfer, continuing education and industrial services for cement and construction industries.

NCB's areas of work span over the entire spectrum of cement manufacturing and usage – starting with geological exploration of raw materials through the processes, the machinery, the manufacturing aspects, energy and environmental considerations to the final utilization of materials in actual construction, condition monitoring & rehabilitation of buildings and structures. NCB started developing Certified Reference Materials (CRMs) since 1990. Since then 79 CRM's have been developed for quality control.

It is a matter of great satisfaction that NCB has produced 12 nos. of Bharatiya Nirdeshak Dravya (BND) in collaboration with CSIR-National Physical Laboratory (NPL), Delhi. Moreover, 5 nos. of new CRMs are being in process for development as BND. The availability of SI traceable BND will bring boost to make in India programme and harmonize the quality infrastructure of the country.

Well equipped with vast experience and comprehensive knowledge about the industry trends and market needs, we are one among the best and I sincerely hope that our advance products and services will continue the make contribution in the growth of Indian economy.

Dr B N Mohapatra  
Director General

**SCOPE OF THE COMPANY:** Research, Technology Development and Transfer, Project Consultancy, Calibration, Testing, Quality Control, Continuing Education and Industrial Services in the field of Cement, Allied Building Materials and Constructions

**INDUSTRIAL DEMAND/MARKET:** Approximately **INR 4.0 Crore**

**POTENTIAL USERS:** Cement Plants, Building Materials & construction testing laboratory, R&D organizations, Government organization, Educational Institute/ Universities

**SOCIETAL IMPACT:** The societal impact is positive. The sale of respective BND in India and abroad results to saving in foreign exchange which led to growth of Indian economy.



BND<sup>®</sup> Produced by National Council for Cement and Building Materials under MoU with CSIR-NPL (NMI of India)

## Cement and Cementitious Materials

S. No.	BND No.	Material Description	Annual Sale (in Sets)
1.	5001	OPC –Blaine fineness	211
2.	5002	PPC-Blaine fineness	385
3.	5003	PSC –Blaine fineness	87
4.	5004	Fly ash –Blaine fineness	179
5.	5006	Composite cement	33
6.	5007	WPC-Blaine fineness	22
7.	5011	OPC higher fineness	134
8.	5021	OPC-Blaine Middle Fineness	143
9.	5051	OPC-Chemical	122
10.	5052	PPC-Chemical	75
11.	5054	Fly ash-Chemical	90
12.	5091	Coal-Chemical	03



# BND<sup>®</sup> 5001

## ORDINARY PORTLAND CEMENT (OPC)

### Blain Fineness



**Purpose:** BND<sup>®</sup> 5001, has been developed for calibrating Blaine Air Permeability Apparatus, developing in-house secondary reference materials for routine control and evaluating proficiency of analysts.  
Specific surface area (Blaine):  $274 \text{ m}^2/\text{kg} \pm 6.4 \text{ m}^2/\text{kg}$   
Specific Gravity: 3.16



# BND<sup>®</sup> 5002

## PORTLAND POZZOLANA CEMENT (PPC)

### Blain Fineness



**Purpose:** BND<sup>®</sup> 5002, has been developed for calibrating Blaine Air Permeability Apparatus, developing in-house secondary reference materials for routine control and evaluating proficiency of analysts  
Specific surface area (Blaine):  $384 \text{ m}^2/\text{kg} \pm 9.3 \text{ m}^2/\text{kg}$   
Specific Gravity: 2.85



**BND<sup>®</sup> 5003**

*PORTLAND SLAG CEMENT(PSC)*

*Blain Fineness*



**Purpose:** BND<sup>®</sup> 5003, has been developed for calibrating Blaine Air Permeability Apparatus, developing in-house secondary reference materials for routine control and evaluating proficiency of analysts  
Specific surface area (Blaine):  $330 \text{ m}^2/\text{kg} \pm 9.3 \text{ m}^2/\text{kg}$   
Specific Gravity: 2.97



**BND<sup>®</sup> 5004**

*FLY ASH*

*Blain Fineness*



**Purpose:** BND<sup>®</sup> 5004, has been developed for calibrating Blaine Air Permeability Apparatus, developing in-house secondary reference materials for routine control and evaluating proficiency of analysts  
Specific surface area (Blaine):  $333 \text{ m}^2/\text{kg} \pm 22.1 \text{ m}^2/\text{kg}$   
Specific Gravity: 2.23



**BND<sup>®</sup> 5006**  
*COMPOSITE CEMENT*  
*Blain Fineness*



**Purpose:** BND<sup>®</sup> 5006, has been developed for calibrating Blaine Air Permeability Apparatus, developing in-house secondary reference materials for routine control and evaluating proficiency of analysts.  
Specific surface area (Blaine):  $372 \text{ m}^2 / \text{kg} \pm 9.3 \text{ m}^2 / \text{kg}$   
Specific Gravity: 2.9



**BND<sup>®</sup> 5007**  
*WHITE PORTLAND CEMENT (WPC)*  
*Blain Fineness*



**Purpose:** BND<sup>®</sup> 5007, has been developed for calibrating Blaine Air Permeability Apparatus, developing in-house secondary reference materials for routine control and evaluating proficiency of analysts.  
Specific surface area (Blaine):  $382 \text{ m}^2 / \text{kg} \pm 8.4 \text{ m}^2 / \text{kg}$   
Specific Gravity: 3.09



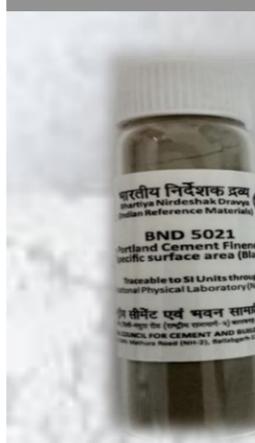
**BND<sup>®</sup> 5011**  
*ORDINARY PORTLAND CEMENT (OPC)*  
*Higher Blaine Fineness*



**Purpose:** BND<sup>®</sup> 5011, has been developed for calibrating Blaine Air Permeability Apparatus, developing in-house secondary reference materials for routine control and evaluating proficiency of analysts.  
Specific surface area (Blaine):  $419 \text{ m}^2/\text{kg} \pm 9.9 \text{ m}^2/\text{kg}$   
Specific Gravity: 3.15



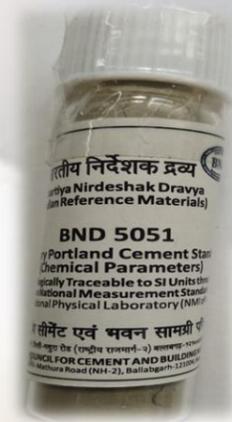
**BND<sup>®</sup> 5021**  
*ORDINARY PORTLAND CEMENT (OPC)*  
*Middle Blaine Fineness*



**Purpose:** BND<sup>®</sup> 5021, has been developed for calibrating Blaine Air Permeability Apparatus, developing in-house secondary reference materials for routine control and evaluating proficiency of analysts.  
Specific surface area (Blaine):  $337 \text{ m}^2/\text{kg} \pm 12.9 \text{ m}^2/\text{kg}$   
Specific Gravity: 3.15



**BND<sup>®</sup> 5051**  
*ORDINARY PORTLAND CEMENT(OPC)*  
*Chemical*

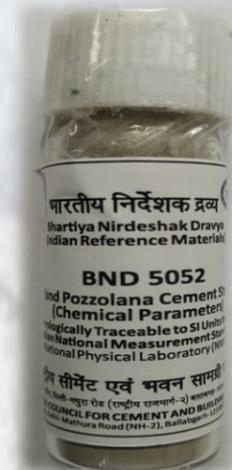


**Purpose:** BND<sup>®</sup> 5051, has been developed for evaluating proficiency of analysts, evaluating/comparing various test methods and calibration of equipment for analyzing minor constituents, for analysis of Ordinary Portland Cement and material of similar matrix.

Chemical Parameters-LOI, SiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub>, Al<sub>2</sub>O<sub>3</sub>, CaO, MgO, SO<sub>3</sub>, IR, Na<sub>2</sub>O, K<sub>2</sub>O and Cl



**BND<sup>®</sup> 5052**  
*PORTLAND POZZOLANA CEMENT(PPC)*  
*Chemical*



**Purpose:** BND<sup>®</sup> 5052, has been developed for evaluating proficiency of analysts, evaluating/comparing various test methods and calibration of equipment for analyzing alkalis, for analysis of Portland Pozzolana Cement and material of similar matrix.

Chemical Parameters- LOI, MgO, SO<sub>3</sub>, IR, Na<sub>2</sub>O, K<sub>2</sub>O and Cl



**BND<sup>®</sup> 5054**  
*FLY ASH*  
*Chemical*



**Purpose:** BND<sup>®</sup> 5054, has been developed for evaluating proficiency of analysts, evaluating/comparing various test methods and calibration of equipment for analyzing alkalis for analysis of Fly ash.

Chemical Parameters- LOI, SiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub>, Al<sub>2</sub>O<sub>3</sub>, CaO, MgO, Na<sub>2</sub>O, K<sub>2</sub>O, SO<sub>3</sub> and Cl



**BND<sup>®</sup> 5091**  
*COAL*  
*Chemical*



**Purpose:** BND<sup>®</sup> 5091, is intended to use as a primary standard for calibration of instruments and validation of method for the characterization of the measurand for the analysis of coal.

Chemical Parameters- Ash, Volatile Matter, Sulphur, Gross Calorific Value



# Reference Material Producer

**Company/Institute Name:** Aashvi Technology LLP.  
**Address:** E-14, Madhavpura Market Shahibaug  
**City:** Ahmedabad, Gujarat (India)  
**ZIP:** 380004  
**Email:** [info@aashvitechnology.com](mailto:info@aashvitechnology.com)  
**Telephone:** +91- 9974145050  
**Weblink:** <https://aashvitechnology.com>



# Aashvi Technology LLP



## *Foreword*



For any business, utmost importance is customer satisfaction through quality product or quality services which not only boost the morale of organization but simultaneously create a quality consciousness within society. Quality directly impacts on health, environment and has knock-on effect on economy. To create quality infrastructure the Certified Reference Materials play a pivotal role.

Aashvi Technology LLP, Ahmedabad, producer of **aQcrm**, Indian Certified Reference Materials known as BND® (Bharatiya Nirdeshak Dravya) under the technology support and traceability established to SI unit by CSIR-NPL (NMI of India). Aashvi Technology, producing BND to cater the need of various sectors viz. Water, Food, Agriculture, Chemicals, Environmental, Pharmaceuticals. These efforts are developed to promote Made in India concept.

Mr Neeraj Kant Panday  
Director (Technical)

**SCOPE OF THE COMPANY:** Aashvi Technology LLP is producing Certified Reference Materials (CRMs) i.e. Bharatiya Nirdeshak Dravya (BND®) at its ISO 17034:2016; ISO/IEC 17025 accredited laboratory (accreditation body is QCI-NABL). The availability of indigenously developed BNDs will strengthen the statutory and regulatory bodies for uplifting the quality infrastructure of the country and thereby production of superior class commodities and products.

Aashvi Technology envisions to bring quality to the society and to make in India products which in turn will mark a positive impact for strong economy of the country. The availability of BNDs at lower cost and in timely manner will create an encouraging and sustainable atmosphere to strengthen quality culture of Indian industry.

BND® produced by ATL are very important and generic in nature, required by various industries for their routine quality control purposes.

**INDUSTRIAL DEMAND/MARKET:** ~ INR 40-45 Billion.

**POTENTIAL USERS:** Water, Food, Chemical, Pharmaceuticals, Agro-chemical Industries, commercial testing R &D Laboratories and Institutions

**ANNUAL SALE:** 40 Lakhs

**SOCIETAL IMPACT:** BNDs produced at Aashvi Technology are not only ensuring quality of products but improve healthcare system, education, technology improvement, protect environment and having a large economic and social impacts.



BND<sup>®</sup> Produced by Aashvi Technology LLP  
under MoU with CSIR-NPL(NMI of India)

Volumetric BNDs	Buffer Solution BNDs	Anions Standard Solution (1000 mg/kg)	Cation Standard Solution (1000 mg/kg)	
Potassium Hydrogen Phthalate	pH 4.00	Bromate	Antimony	Arsenic
Sodium Chloride	pH 7.00	Nitrate	Aluminium	Barium
Potassium Dichromate	pH 9.00	Nitrite	Boron	Calcium
Calcium Carbonate	pH 9.20	Sulphate	Cadmium	Chromium
Sodium Carbonate		Fluoride	Copper	Iron
Ammonium Sulphate	Other BNDs		Lead	Magnesium
 Aashvi Technology LLP	Conductivity 1.41 ms/cm		Manganese	Mercury
			Nickel	Potassium
	Total Dissolved solids (1000ppm)		Selenium	Sodium
			Silver	Zinc

List of 37 BND<sup>®</sup>



## BND<sup>®</sup> 1003 COPPER STANDARD SOLUTION



**Purpose:** Primary calibration standard for the quantitative determination of copper, calibration of instruments and validation of method for the quantification/ characterization of measurand.

Copper Standard Solution: 988 mg/kg  $\pm$  6 mg/kg



## BND<sup>®</sup> 1004 NICKEL STANDARD SOLUTION



**Purpose:** Primary calibration standard for the quantitative determination of nickel, calibration of instruments and validation of method for the quantification/ characterization of measurand.

Nickel Standard Solution: 979 mg/kg  $\pm$  5 mg/kg



## BND<sup>®</sup> 1005 pH BUFFER SOLUTION 4.00



**Purpose:** Calibration standard for calibration of pH instruments and validation of method for determination of the pH value.

pH Buffer Solution:  $4.01 \pm 0.03$



## BND<sup>®</sup> 1006 pH BUFFER SOLUTION 7.00



**Purpose:** Calibration standard for calibration of pH instruments and validation of method for determination of the pH value.

pH Buffer Solution:  $7.00 \pm 0.03$



## BND<sup>®</sup> 1007 *pH BUFFER SOLUTION 9.00*



**Purpose:** Calibration standard for calibration of pH instruments and validation of method for determination of the pH value.

pH Buffer Solution:  $9.05 \pm 0.05$



## BND<sup>®</sup> 1010 *LEAD STANDARD SOLUTION*



**Purpose:** Primary calibration standard for the quantitative determination of lead, calibration of instruments and validation of method for the quantification/ characterization of measurand.

Lead Standard Solution:  $981 \text{ mg/kg} \pm 6 \text{ mg/kg}$



## BND<sup>®</sup> 1011 ARSENIC STANDARD SOLUTION



**Purpose:** Primary Calibration standard for quantitative determination of Arsenic calibration of instrument and validation of method for the quantification/ characterization of the measurand.

Arsenic Standard Solution: 988 mg/kg  $\pm$  5 mg/kg



## BND<sup>®</sup> 1012 MERCURY STANDARD SOLUTION



**Purpose:** Primary calibration standard for the quantitative determination of Mercury, calibration of instruments and validation of method for the quantification/ characterization of the measurand.

Mercury Standard Solution: 936 mg/kg  $\pm$  5 mg/kg



## BND<sup>®</sup> 1013 CADMIUM STANDARD SOLUTION



**Purpose:** Primary Calibration standard for quantitative determination of Cadmium calibration of instrument and validation of method for the quantification/ characterization of the measurand.

Cadmium Standard Solution:  $979 \text{ mg/kg} \pm 6 \text{ mg/kg}$



## BND<sup>®</sup> 1015 ZINC STANDARD SOLUTION



**Purpose:** Primary Calibration standard for quantitative determination of Zinc calibration of instrument and validation of method for the quantification/ characterization of the measurand.

Zinc Standard Solution:  $982 \text{ mg/kg} \pm 6 \text{ mg/kg}$



**BND<sup>®</sup> 1016**

**POTASSIUM HYDROGEN PHTHALATE**



**Purpose:** Primary titrimetric standard for the standardization of volumetric standard solutions and validation of standard methods.

Potassium Hydrogen Phthalate :  $100.00 \pm 0.22$ (w/w %)



**BND<sup>®</sup> 1017**

**POTASSIUM DICHROMATE**



**Purpose:** Primary titrimetric standard for the standardization of volumetric standard solutions and validation of standard methods.

Potassium Dichromate:  $(99.92 \pm 0.21)$  %



## BND<sup>®</sup> 1018 *SODIUM CHLORIDE*



**Purpose:** Primary standard for the standardization of titrimetric and volumetric standard solutions for the validation of standard methods.

Sodium Chloride:  $99.94 \pm 0.27$  (w/w %)



## BND<sup>®</sup> 1019 *IRON STANDARD SOLUTION*



**Purpose:** Primary Calibration standard for quantitative determination of Iron calibration of instrument and validation of method for the quantification/characterization of the measurand.

Iron standard solution:  $983 \text{ mg/kg} \pm 7 \text{ mg/kg}$



## BND<sup>®</sup> 1021 TDS STANDARD SOLUTION



**Purpose:** Gravimetric standard for the validation of standard methods and calibration

Total Dissolve Solids:  $997 \text{ mg/kg} \pm 7 \text{ mg/kg}$



## BND<sup>®</sup> 1023 SODIUM CARBONATE



**Purpose:** Primary titrimetric standard for the standardization of volumetric standard solutions and validation of standard methods

Sodium Carbonate:  $99.98 \pm 0.19 \text{ (w/w \%)}$



# BND<sup>®</sup> 1024 CALCIUM CARBONATE



**Purpose:** Primary titrimetric standard for the standardization of volumetric standard solutions and validation of standard methods

Calcium Carbonate: 100.00 ± 0.20 (w/w %)



# Reference Material Producer

हिन्दुस्तान पेट्रोलियम



**Company/Institute Name:** Hindustan Petroleum Co. Ltd.

**Address:** Visakha new white oil terminal, Port connectivity road, opposite INS Dega

**City:** Visakhapatnam

**ZIP:** 530014

**Email:** [hpcrm@hpcl.in](mailto:hpcrm@hpcl.in)

**Telephone:** 0891-2826906

**Weblink:** [www.hindustanpetroleum.com](http://www.hindustanpetroleum.com)





## Foreword



HPCL and CSIR-National Physical Laboratory (National Measurement Institute of India) created history when the 28 numbers of Petroleum BNDs, the National Traceability standards for petroleum products certification, developed jointly by HPCL & CSIR – NPL were released on the historical occasion of World Metrology Day-20<sup>th</sup> May 2019(26 Nos) & CSIR Foundation day – 27.09.2019 (2 Nos). These BNDs will provide traceability for all vital parameters of Petroleum products testing and certification comprising of 15 physical properties, 02 Physicochemical Properties and 11 Chemical Properties including BND for sulfur content measurement at lower concentrations.

HPCL, a Maharatna CPSE, is playing significant role in meeting the energy demands of the nation. HPCL have a Quality Control dept in Marketing which monitors the quality of Petroleum products during the receipt, storage and distribution. QC dept of HPCL is pioneer in producing CRMs in India in the field of petroleum sector under “Make in India” initiative. CSIR National Physical Laboratory is the National Measurement Institute of India by act of Parliament and custodian of the fundamental units of measurement. “Accurate and precise measurements are essential to drive the growth engines of Indian Science & Industry”. Developing India’s measurement standards that are internationally accepted and disseminating the measurement capabilities is essential for progress. The need becomes all the more obvious in case of petroleum product used by various stakeholders including common man.

This initiative of HPCL has received Prestigious Quality Council of India- DL Shah National Quality Award in Platinum Category in year 2019. These BNDs were also launched on COMAR (**CO**de d’Indexation des **MA**tériaux de **R**éférence), an international agency based in Germany which assist users in finding the Certified Reference Materials they need and thereby giving global reach for the BNDs.

This initiative will not only save vital foreign exchange thru import substitution for CRMs rather will also ensure maintaining highest standard quality ecosystem for petroleum products. This initiative will be a milestone in ensuring “Self-Reliant India “and makes “Local Vocal “as per the clarion call given by Hon’ble Prime Minister.

C Madhusudan  
Chief General Manager  
Quality Control, HPCL



## BND<sup>®</sup> 7001 *SULPHUR IN DIESEL*



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of total sulfur in diesel or materials of similar matrix.

Sulphur in Diesel:  $2.5 \pm 0.75$  mg/kg



## BND<sup>®</sup> 7002 *SULPHUR IN DIESEL*



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of total sulfur in diesel or materials of similar matrix.

Sulphur in Diesel:  $5 \pm 1.5$  mg/kg





## BND<sup>®</sup> 7003 *SULPHUR IN DIESEL*



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of total sulfur in diesel or materials of similar matrix.

Sulphur in Diesel:  $10.0 \pm 1.5$  mg/kg



## BND<sup>®</sup> 7004 *SULPHUR IN GASOLINE*



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of total sulfur in gasoline or materials of similar matrix.

Sulphur in Gasoline:  $25.0 \pm 2.5$  mg/kg





## BND<sup>®</sup> 7005 *SULPHUR IN DIESEL*



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of total sulfur in diesel or materials of similar matrix.

Sulphur in Diesel:  $50.0 \pm 2.5$  mg/kg



## BND<sup>®</sup> 7006 *SULPHUR IN GASOLINE*



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of total sulfur in gasoline or materials of similar matrix.

Sulphur in Gasoline:  $50.0 \pm 2.5$  mg/kg





## BND<sup>®</sup> 7007 *SULPHUR IN KEROSENE*



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of total sulfur in kerosene or materials of similar matrix.

Sulphur in Kerosene:  $1000 \pm 20$  mg/kg



## BND<sup>®</sup> 7008 *DENSITY PETROLEUM OIL*



**Purpose:** Primary Standard for equipment performance check or calibration as per the standard test procedure.

Density:  $824.9 \pm 3.2$  kg/m<sup>3</sup>





**BND<sup>®</sup> 7009**

***KINEMATIC VISCOSITY PETROLEUM OIL***



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of Kinematic Viscosity.

Kinematic Viscosity at 40 °C:  $2.917 \pm 0.02$  cSt



**BND<sup>®</sup> 7010**

***KINEMATIC VISCOSITY MINERAL OIL***



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of Kinematic Viscosity.

Kinematic Viscosity at 50 °C:  $170.2 \pm 0.6$  cSt





**BND<sup>®</sup> 7011**

*KINEMATIC VISCOSITY MINERAL OIL*



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of Kinematic Viscosity.

Kinematic Viscosity at 100 °C: 10.64 ± 0.04 cSt



**BND<sup>®</sup> 7012**

*KINEMATIC VISCOSITY PETROLEUM OIL*



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of Kinematic Viscosity.

Kinematic Viscosity at (-)20 °C: 3.171 ± 0.022 cSt





## BND<sup>®</sup> 7013 *FREEZING POINT PETROLEUM*



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of Freezing Point.

Freezing Point:  $-57.5 \pm 1.5^{\circ}\text{C}$



## BND<sup>®</sup> 7014 *FLASH POINT (ABEL) PETROLEUM*



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of Flash Point (Abel).

Flash Point (Abel):  $40.5 \pm 1.5^{\circ}\text{C}$





## BND<sup>®</sup> 7015 *FLASH POINT - PMCC MINERAL OIL*

**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of Flash Point (PMCC).

Flash point PMCC:  $74.5 \pm 3.5$  °C



## BND<sup>®</sup> 7016 *FLASH POINT - COC MINERAL OIL*

**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of Flash Point (COC).

Flash point COC:  $212 \pm 15$  °C





## BND<sup>®</sup> 7017 *SMOKE POINT PETROLEUM*

**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of total Smoke point of Petroleum Oils and materials of similar matrix like ATF matrix

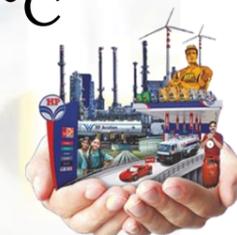
Smoke Point:  $23 \pm 2$  mm



## BND<sup>®</sup> 7018 *DISTILLATION STANDARD-Group 2 PETROLEUM*

**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of Distillation properties of Petroleum Oils or oils of similar matrix

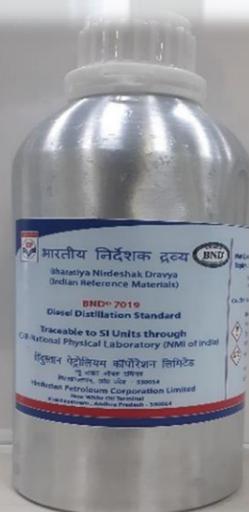
Distillation Standard-Group 2: Range 34.3 to 193.4 °C





**BND<sup>®</sup> 7019**

***DISTILLATION STANDARD-Group 4 PETROLEUM***



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of Distillation properties of Petroleum Oils or oils of similar matrix

Distillation Standard-Group 4: Range 182.2 to 362.8 °C



**BND<sup>®</sup> 7020**

***POUR POINT PETROLEUM***



**Purpose:** Use for the evaluation of test methods Pour Point of Petroleum Oils or oils of similar matrix

Pour Point:  $-6.0 \pm 3.0^{\circ}\text{C}$





## BND<sup>®</sup> 7021 *COLOUR SAYBOLT PETROLEUM*



**Purpose:** Calibration of instruments, evaluation of test methods and performance verification of equipment used in the determination of Saybolt Colour.

Colour Saybolt:  $24 \pm 1$  Saybolt Colour units



## BND<sup>®</sup> 7022 *COLOUR ASTM MINERAL OIL*



**Purpose:** Use for the evaluation of test methods, performance verification of equipment used in the determination of Colour ASTM

Colour ASTM:  $4 \pm 1$  ASTM Colour units





# BND<sup>®</sup> 7023

## TOTAL BASE NUMBER MINERAL OIL



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of total base number in Mineral oil / Mineral oil matrix matching material.

Total Base Number: Mass Fraction:  $9.22 \pm 0.27$  mg KOH/g



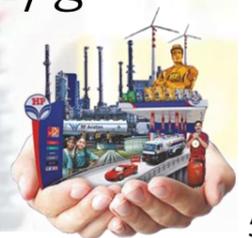
# BND<sup>®</sup> 7024

## TOTAL ACID NUMBER MINERAL OIL



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of total acid number in Mineral oil / Mineral oil matrix matching material.

Total Acid Number: Mass Fraction:  $1.64 \pm 0.12$  mg KOH/g





**BND<sup>®</sup> 7025**

*FIA-AROMATIC, OLEFINS, SATURATES Petroleum*



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of Aromatic, Olefins and Saturates content in Petroleum Oils or oils of similar matrix

FIA-Aromatics, Olefins, Saturates:

Aromatics:  $17.0 \pm 1.2$  (% , v/v)

Olefins:  $0.9 \pm 0.1$  (% , v/v)

Saturates:  $82.1 \pm 1.2$  (% , v/v)



**BND<sup>®</sup> 7026**

*SULFUR IN GASOLINE*



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of total sulfur in Gasoline or materials of similar matrix.

Sulfur in Gasoline:  $2.5 \text{ mg/kg} \pm 0.75 \text{ mg/kg}$





## BND<sup>®</sup> 7027 *SULFUR IN GASOLINE*



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of total sulfur in Gasoline or materials of similar matrix.

Sulfur in Gasoline:  $5.0 \pm 1.5$  mg/kg



## BND<sup>®</sup> 7028 *SULFUR IN GASOLINE*



**Purpose:** Calibration of instruments and the evaluation of test methods used in the determination of total sulfur in Gasoline or materials of similar matrix.

Sulfur in Gasoline:  $10.0 \pm 1.5$  mg/kg





# Reference Material Producer



**Company/Institute Name:** Global PT Provider Private Limited

**Address:** F-89/22, Okhla Industrial Area, Phase-I

**City:** NEW DELHI,

**ZIP:** 110020

**Email:** [umesh@globalptprovider.com](mailto:umesh@globalptprovider.com)

**Telephone:** 011-40722200

**Weblink:** [www.globalptprovider.com](http://www.globalptprovider.com)



# Global PT Provider Private Limited



## *Foreword*



Our Hardness blocks are certified through our ISO 17043 accredited Inter-laboratory certification program which is dedicated to the production and development of the highest quality certified reference materials (CRMs). A key feature of this program is the traceability of CRM to the National Physical Laboratory.

Global PT hardness test blocks set the standard for the industry and are made from the highest quality material to insure the most uniform and repeatable test blocks available. A comprehensive variety of scales and hardness test blocks are available to meet the wide ranges and hardness scales associated with Rockwell, Brinell and Vickers.

Umesh Gupta  
Chief Executive Officer

## **SCOPE OF THE COMPANY/ INSTITUTE**

Reference Material for Physical & Chemical Properties of Metals.

Chemical Composition

Hardness Blocks (Rockwell, Vickers, Micro Vickers, Brinell)

Tensile Properties

**INDUSTRIAL DEMAND/MARKET:** 10 thousand Hardness Blocks in a year catering Automobile, Aerospace Industry, Commercial Metallurgical Laboratories etc.

**POTENTIAL USERS:** These blocks will serve Automobile, Metallurgical Testing Lab, Steel Manufacturing, Railway, Defence and Aerospace industry. We are also committed to help the whole Indian industry suffering with traceability issues from long time and launch more Indian reference materials which will effectively reduce the cost of Indian laboratories.

**ANNUAL SALE:** Projected Annual Sale is 20 Lakhs for first year and 1 crore next year

**SOCIETAL IMPACT:** This will reduce the import of at least 1.5 Crores in first year and 5 crores in next year



## BND<sup>®</sup> 2201 ROCKWELL HARDNESS



**Purpose:** Rockwell Hardness reference blocks are used for periodic check or verification of hardness testing machines.

Rockwell Hardness (C Scale):  $44.33 \pm 0.83$



## BND<sup>®</sup> 2202 ROCKWELL HARDNESS



**Purpose:** Rockwell Hardness reference blocks are used for periodic check or verification of hardness testing machines.

Rockwell Hardness (C Scale):  $61.04 \pm 0.77$



# BND<sup>®</sup> 2202 ROCKWELL HARDNESS



**Purpose:** Vickers Hardness reference blocks are used for periodic check or verification of hardness testing machines.

Vickers Hardness (5 kgf/49.03N Load):  $735.6 \pm 13.9$





# Upcoming BNDs

<b>S. No</b>	<b>BND<sup>®</sup> Number</b>	<b>Name of Material</b>	<b>Purpose</b>
1.	BND 2005-P	Si/Pt nanorods	Magnification calibration Standard for TEM/SEM
2.	BND 1001-P	Aqueous Fluoride Standard Solution	Primary calibration standard for quantitative determination of fluoride
3.	BND 1002-P	Aqueous Copper Standard Solution	Primary calibration standard for quantitative determination of copper
4.	BND 2002-P	Alpha Quartz (SiO <sub>2</sub> )	Powder X-ray diffraction reference
5.	BND 2003-P	Mullite (Al <sub>6</sub> Si <sub>2</sub> O <sub>13</sub> )	Powder X-ray diffraction reference
6.	BND 2006-P	Gold on Copper Grid	Magnification calibration Standard for TEM
7.	BND 3001-P	Contaminants in Rice Flour Standards	Toxic elements in Rice Flour for calibration of equipment

8.	BND 2901-P	Gold Nano-Particle (15nm particle size)	Particle size standard
9.	BND 2007-P	Opto mMicro Ruler	Ruler Au/Ti on Si/SiO <sub>2</sub> substrate to calibrate optical microscopes, stereoscopes, scale rulers etc
10.	BND 2008-P	TransMicro Ruler	Ruler Au/Ti on ITO substrate to calibrate optical microscopes, stereoscopes, scale rulers etc
11.	BND 2010-P	Nano Squ & Gaps	Nanosquares (Pt or W) and Nanogaps fabricated on carbon coated TEM grid to calibrate SEM and FESEM
12.	BND 2011-P	SEM Res Test Sample	Au nano islands on carbon tape or Si/SiO <sub>2</sub> substrate for magnification and resolution test of SEM
13.	BND 2012-P	Body/Tissue equivalent liquid 900MHz	The body/ tissue equivalent liquids are useful for SAR value assessments for various wireless devices and further estimation of their impact on humans. Ach liquid behaves at par with human body electric properties

			like permittivity, loss and conductivity at said frequency.
14.	BND 2013-P	Body/Tissue equivalent liquid 1800MHz	The body/ tissue equivalent liquids are useful for SAR value assessments for various wireless devices and further estimation of their impact on humans. Ach liquid behaves at par with human body electric properties like permittivity, loss and conductivity at said frequency.
15.	BND 2014-P	Body/Tissue equivalent liquid 2100MHz	The body/ tissue equivalent liquids are useful for SAR value assessments for various wireless devices and further estimation of their impact on humans. Ach liquid behaves at par with human body electric properties like permittivity, loss and conductivity at said frequency.

16.	BND 2015-P	Body/Tissue equivalent liquid 2300MHz	The body/ tissue equivalent liquids are useful for SAR value assessments for various wireless devices and further estimation of their impact on humans. Ach liquid behaves at par with human body electric properties like permittivity, loss and conductivity at said frequency.
17.	BND 2016-P	Body/Tissue equivalent liquid 2450MHz	The body/ tissue equivalent liquids are useful for SAR value assessments for various wireless devices and further estimation of their impact on humans. Ach liquid behaves at par with human body electric properties like permittivity, loss and conductivity at said frequency.
18.	BND 2017-P	Body/Tissue equivalent liquid 5800MHz	The body/ tissue equivalent liquids are useful for SAR value assessments for various wireless devices and further estimation of their impact on humans. Ach liquid behaves at par with human body electric properties

			like permittivity, loss and conductivity at said frequency.
19.	BND 2018-P	Polystyrene	For GPC instrument calibration to defined the polymers in tern Mw, PDI etc
20.	BND 2019-P	Silicon Dioxide Film Thickness Standard	Calibration of Optical instruments such as single wavelength and spectroscopic ellipsometers and reflectometers for thickness
21.	BND 2020-P	Holmium Oxide Glass (Film) wavelength standard	calibration of spectrophotometers
22.	BND 2021-P	Potassium Dichromate Solution	calibration of absorbance scale in UV/Vis spectrophotometer
23.	BND 2022-P	Holmium oxide solution	reference material for validating the wavelength scale of UV/Vis spectrophotometer
24.	BND 2902-P	ZnO nanoparticles (4-6 nm size, monodispersed solution)	particle size calibration for electron microscopy
25.	BND 2903-P	Silica Nanoparticles (300 nm size) powder	calibration of PM 2.5 and PM 10

26.	BND 2023-P	Cyclohexane	Wave number calibrator for Raman Spectrometer
27.	BND 3001-P	Honey	Carbohydrate contain in Honey
28.	BND 2024-P	Silicon Powder	XRD line position and shape
29.	BND 2025-P	LaB <sub>6</sub> Powder	XRD line shape and Intensity

\*\*P- Provisional. (Temporarily BND number were allotted until the release)



The comparable measurement i.e. “once measured or tested, globally accepted”, strengthen the quality life of the consumers and enhance the socio-economic fabric of the societies through unhindered trade.

The availability of indigenous BNDs in the country is poised to reinforce and realise *National Mission* on “**Make in India**” and “**Self-Reliance**”.

**Compiled by:** Dr S.P. Singh, Dr Pallavi Kushwaha, Dr Sandeep Singh  
BND Management Section, CSIR-NPL