POWDER METALLURGY ASSOCIATION OF INDIA

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Editorial

The International Conference and Trade Exhibition PM-17 will be held at the hotel Pride Plaza in Aerocity, New Delhi. Preparation for this event which runs concurrently with the 43rd ATM of PMAI is progressing smoothly. A sponsored article on particle characterization and its relevance in powder metallurgy should be interesting to powder producers in their efforts to develop and consistently control powder properties to meet the increasing demands of high performance parts. Congratulations to Singhal Sintered Pvt. Ltd for their recognition during the partners meet of Godrej. Other topics covered in this issue are the Powder Metallurgy Short Course - PMSC 16, to be held between 14-17 Dec, 2016 at VIT University campus in Chennai, achievements in the development of nano-powder metallurgy activities at MNIT Jaipur by Prof. Soni & his team, PMAI participation in the International Conference MET+HTS 2016, Mumbai of ASM International India Chapter and later at the IMTEX 2017 exhibition in Bangalore. The Trans.PMAI, Vol.41, No.2, Dec.2015 is now available on our website www.pmai.in PMAI is grateful to Malvern Aimil Instruments Pvt. Ltd., for sponsoring this issue.

P. Ramakrishnan

Appeal

We need from PMAI members, news items for publication in this (thrice yearly) newsletter.

We mean stuff like technical developments, new products, business developments, promotions, job changes, organizational changes, mergers & acquisitions or just plain gossip.

We would like to publish your stories (editorial rights reserved) regularly.

PM 17 at New Delhi

Powder Metallurgy Association of India (PMAI) is conducting its next annual international conference between 20 & 22 Feb, 2017 in Hotel Pride Plaza, Aerocity, New Delhi. PM 17 will attract delegates from all over the world involved with powder metallurgy, powder injection molding, particulate materials, and metal additive manufacturing industries. The concurrent exhibition is the best way for potential suppliers to reach industry leaders. Exhibitors get an opportunity to meet with their customers during the course of the three-day conference, during conference meals and special events.

Are you a member in PMAI? If not, join now.

www.pmai.in/in www.pmai.in/pm17

NANO POWDER METALLURGY AT MNIT, JAIPUR

MNIT Jaipur is carrying out some innovative work related to nano powder metallurgy.

They have completed work related to plasma sprayed nano-structured composite coatings using P/M feed stock powder.

They have researched and produced nano iron and copper powder using the mechanically activated cementation process. This work has recently been published in the international journal 'Powder Technology' (Elsevier).

They are now in the process of developing high efficiency (>50%) nano silicon solar cells. As and when success is achieved the impact of this work will be felt worldwide & be a credit to the Indian PM community.

Congratulation from all at PMAI to Prof. P. R. Soni & his team

Award from Godrej Appliance Division

Singhal Sintered Pvt. Ltd. who is a Patron member of PMAI since 2011and has been honored by **Godrej Appliance Division** during partners meet on 23rd May, 2016 in Mumbai as **"BEST SUPPORT- DELIVERY"**.

PMAI Participation

MET+HTS 2016, Mumbai
PMAI is participating in International Conference MET+HTS 2016, Mumbai of ASM International India
12 – 14 Oct, 2016. Visit our stall.

IMTEX 2017, Bangalore
PMAI is participating in IMTEX 2017, Bangalore
26 Jan to 1 Feb 2017. Visit stall No: A129.
Powder & parts manufacturers may visit http://www.pmai.in/en/supplier_directory.php & fill their details in the supplier directory for distribution at our stall.

SPONSORED ARTICLE BY MALVERN AMIL, N.DELHI

Particle Characterization and Its Relevance in Powder Metallurgy

Powder Metallurgy – an evolving technology

Powder metallurgy is a continually and rapidly evolving technology embracing most metallic alloy materials, ceramics and composites producing a wide variety of shapes. It is a highly developed method of manufacturing reliable ferrous and non-ferrous parts. India is a significant producer and consumer of powder metallurgy components. It is estimated that total production of iron base PM components in India reached 30,500 tons in 2015 with copper base parts reaching 9,800 tons. More than 75% of the PM components produced in the country are destined for the automobile sector. Apart from automobile industries, a variety of other industries like food processing (dietary supplements), paints and pigments, printing and packaging also have a significant demand for metal powders.

Increasing the efficiency of Metal Powder Production

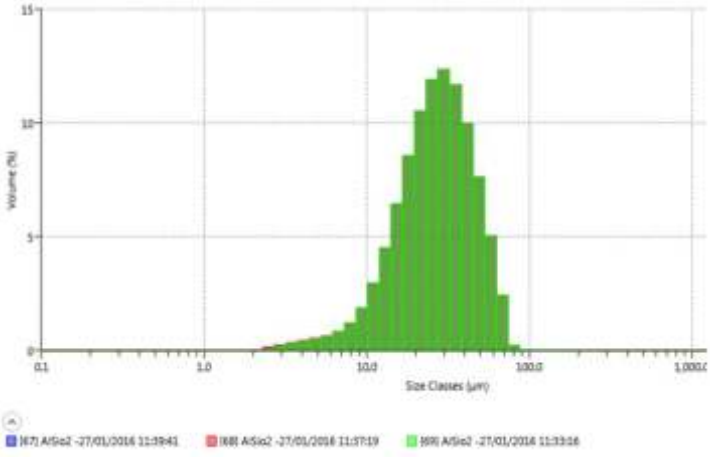
Particle size and particle size distribution, along with other parameters such as particle shape dictate the efficiency of every stage of this process and have a direct influence on the bulk properties of the finished product. For instance, a finer particle size may improve bulk characteristics, such as porosity or hardenability, but larger particles will tend to flow better – a crucial property during filling of the mould and blending.

Particle size is a defining parameter for metal powders, those specified for powder metallurgy tending to lie in the range of 0.1 to 1000 microns. Atomisation is the most commonly used metal powder production technique, but milling is also routinely applied. Both processes are extremely energy intensive so it is vital to monitor operating conditions not only to tailor the size of the particle, but also to minimize energy consumption. Mono disperse size distributions can produce high particle packing densities, though if constituted of larger particles packing will be inefficient. Here, a wider particle size distribution may be helpful, since voids left by adjacent large particles can be filled with progressively smaller ones. During sintering, fine particles leave only small pores which easily close, enhancing the integrity of the finished product. However, an

excess of fines can have a detrimental effect on powder flow behavior and increase the safety hazards associated with handling. Clearly the creation of an optimally sized powder requires a careful balancing of all relevant properties; particle sizing technology plays an essential role in helping metal powder manufacturers to achieve this goal.

Laser diffraction is well established across the particulate processing industries as an effective technique for measuring particle size distribution. The technique is known for its operational simplicity, and modern laboratory instruments are highly flexible, easy to use and in many cases completely automated. Furthermore, the intrinsic advantages of laser diffraction – no need for calibration, amenability to automation, and speed – has enabled its effective transition from the laboratory to the production line. Malvern Instruments Mastersizer 3000 laser diffraction based particle size analyser has a measurement range of 10 nm to 3.5 mm and covers the entire particle size range one may come across for different types of materials in powder metallurgy industry.

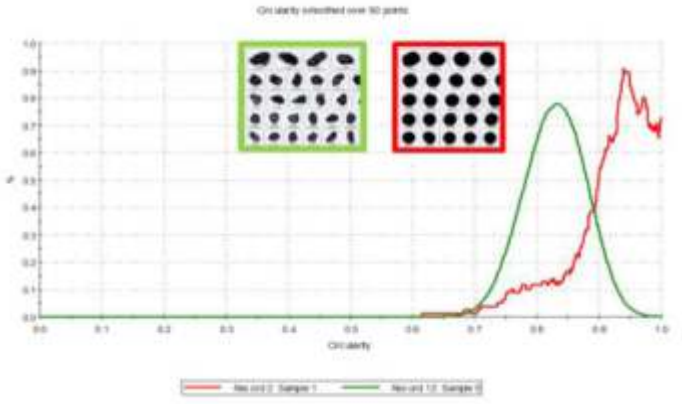
The Mastersizer 3000 can analyse powders in dry form or suspensions/slurries of the same. The dry powder dispersion unit Aero S can control dispersive air pressure very precisely. The following histogram indicates that there is no impact of dispersive air pressure on the sample AlSiO2.



Improving the Quality of Metal Powders

The way the particles pack together is a function of particle size and size distribution and indeed shape. Monitoring and controlling particle shape along with size improves the characteristics of metal powders. The innovation of powerful imaging technology that provides statistically valid shape measurements in a matter of minutes is a big enabler here. The Morphologi® G3 from Malvern Instruments allows precise identification of various shape parameters and their correlation with Flowability, packing behaviour can be easily established. This along with the statistically significant data produced, is practically impossible to achieve with traditional techniques like manual microscopy.

The following figure shows shape distribution data for two samples of metal powder measured using Malvern Morphologi G3. Here, the shape parameter being assessed is circularity which gives an idea how close the particles are to being spherical. A mean value close to 1 would indicate perfectly spherical particles whereas a mean value closer to 0 indicates irregular particles. In this case Sample 1 is more circular and thus will be having a better flow property than sample 5 which has more irregular shaped particles. Shape data such as these provide important insight into the atomization process and are complimentary to particle size analysis data.



An Orthogonal Approach to Metal Powder Development

Together, particle size and particle shape provide closer control of milling and atomization processes and enable metal powder producers to develop and consistently control powder properties to meet demanding and ever-evolving performance targets.

For more details, please contact: delhi@aimil.com

Technology that's Instrumental In Your Success

- PARTICLE SIZE
- PARTICLE SHAPE
- RHEOLOGICAL PROPERTIES
- MOLECULAR WEIGHT
- MOLECULAR SIZE
- MOLECULAR STRUCTURE
- SOLUTION VISCOSITY
- ZETA POTENTIAL
- CHEMICAL IDENTIFICATION

MASTERSIZER 3000

Smarter Particle Sizing

- PARTICLE SIZE

ZETASIZER NANO

Size and stability characterization

- PARTICLE SIZE
- ZETA POTENTIAL
- MOLECULAR WEIGHT
- MOLECULAR SIZE
- RHEOLOGICAL PROPERTIES

MORPHOLOGI G3

Advanced particle characterization made easy

- PARTICLE SIZE
- PARTICLE SHAPE

RHEOMETER

More rheology, less effort

- RHEOLOGICAL PROPERTIES

INSITEC

Pharmaceutical Pat

- PARTICLE SIZE

and many more...

Malvern Aimil

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PMSC 16

POWDER METALLURGY SHORT COURSE

Powder Metallurgy Association of India in association with VIT University

Wed. 14th – Sat. 17th December, 2016

More details & online registration at www.pmai.in/pmsc16
Email: pmsc16@pmai.in

Venue
VIT University, Chennai Campus
Vandalur - Kelambakkam Road
(near Vandalur Zoo)
Chennai - 600 127

Conveners
Dr. V. Umasankar (VIT), Dr. N. B. Dhokey (CoEP)

PMSC has an intensive curriculum covering the complete portfolio of PM technologies & calls for full involvement from morning to evening. Participants will acquire a fundamental understanding of the science & practice of PM as well as the breadth of the subject.

Participants will be tested for knowledge acquired and will be issued a certificate from PMAI. Participation is restricted to 60, first come first served.

The course is useful for:

- Line Executives & Project Managers
- Maintenance & Process Engineers
- Application Development Engineers
- Materials Research Scientists / Engineers
- Consultants
- Teaching & Research Faculty of Engineering Universities / Colleges
- Students

Takeaways

- Good understanding of all PM technologies & processing techniques
- Clarity on selection criteria for applicable technologies & materials
- Understanding of materials degradation mechanisms under various working environments
- Illustration of and guidelines for successful product development
- Product characterization and performance evaluation methods
- Introduction to manufacturing standards
- Certificate to those who qualify

Topics

- Powder Production
- Characterization of Powders
- Consolidation of Powders & Presses
- Design and Fabrication of Dies and Tooling
- Sintering
- Characterization and Evaluation of Sintered Components
- Powder Injection Molding (MIM + CIM)
- Sintering Furnaces and Atmospheres
- Heat Treatment & other downstream processes & equipment
- Quality in PM Manufacturing
- Porous PM Materials
- Advanced Ceramics and Composites
- Aerospace and Defense Materials
- PM in Nuclear Engineering and Energy Generation
- PM in Bio Materials
- Friction Materials
- Additive Manufacturing (3D printing)

Faculty

A judicious mix of experts from industry and academia comprise the faculty for PMSC 16

Industry visit: An industry visit to Fluidtherm Technology for a lecture on and demonstration of atmospheres & furnaces for sintering, sinter hardening and high temperature sintering as well as an overview of PM standards will be organised on the last day, Sat 17th Dec, 2016.

1st ANNOUNCEMENT & CALL FOR PAPERS

Details & online registration at www.pmai.in/pm17

PM 17

Several amazing awards are being offered during PM17 including fully paid attendance at a PM Conference and / or exhibition outside India as well as several other generous grants. Details at www.pmai.in/pm17

INTERNATIONAL CONFERENCE ON POWDER METALLURGY & PARTICULATE MATERIALS + EXHIBITION

and the

43rd ANNUAL TECHNICAL MEETING OF PMAI

Call for papers & Deadlines

■ Submission of abstracts for oral presentation	09 Dec, 2016
■ Acceptance of abstracts	20 Dec, 2016
■ Submission of the complete paper*	31 Jan, 2017

*Only complete papers that are received by the deadline and presented at the conference will be published in the Transactions of PMAI (after peer review) and be eligible for awards

Mon 20th to Wed 22nd, February 2017

Hotel Pride Plaza
Aerocity (IGI Airport)
New Delhi, India

www.pmai.in