Austria

AM Ceramics 2018

Due to the success of AM Ceramics in the previous two years, Lithoz organised again in Vienna/AT on 9–10 October 2018 a two-days conference, and achieved a new record with over 100 attendees. Following the target to connect and strengthen the bonds between research and industry they have proven to be on the right track. The 3rd AM Ceramics was opened by Dr Johannes Homa, CEO of Lithoz/AT and host of the event. Prof. Jens Günster (BAM-Bundesanstalt für Materialforschung/DE), also responsible for „Szene Additiv" at DKG (German Ceramic Society), moderated the sessions with his expert knowledge of ceramics and 3D-printing. AM (Additive Manufacturing) on the edge to enter production technology inspired experts from the suppliers industry (raw materials), ceramic manufacturers and scientists to attend. Four core topics were selected for the event: AM General, Material, Application and Medical.

AM General

Tom Wasley (MTC/GB) gave the first presentation, discussing aspects involved in the wider adaptation of AM technology in industry. **Ceramic AM Process and Supply Chain Evaluation: De-Risking Technology Adoption** was the headline of his talk. Although there has been a growth in the adaptation and usage of AM, there is still a reluctance to employ this technology due to the innovative changes it brings and its rapid growth, he stated.

Prof. Thomas Graule (EMPA/CH) presented the topic **From Micro to Macro – Perspectives of LCM-Based Stereolithography** and spoke about the development of UV-curable acrylate-based ceramic dispersions and how they can be shaped to become dense or porous green and sintered parts, focusing particularly on microparts and gradient structures.

Dr Alexander Platzer (Imerys Technology Center Austria GmbH/AT) shared his insight into the requirements for the 3D-printing of casting cores and compared the material properties of slurry and pre-fired AM ceramic mixes with the existing technology of injection moulding. Ceramic core spacers for foundry industry are interesting components for AM technology.

Fig. 1 Dr Johannes Homa (Lithoz), Prof. Jens Günster (BAM), Karin Scharrer (CERAMIC APPLICATIONS), and Dr Holger Wampers (ALUMINA SYSTEMS; f. l. t. r.) (Source: Lithoz)

Following the conclusion of the first session, there was an engaging discussion about **Future Perspectives: AM for Industry.** Prof. Günster then gave an impulse lecture concerning **Printing on the Moon**, and showcased various innovative experiments related to the possibility of printing under microgravity.

The first session was followed by a panel discussion moderated by Dr Johannes Homa, with Jens Günster (BAM/DE), Holger Wampers (ALUMINA SYSTEMS/DE) and Karin Scharrer (Göller Verlag/DE) sharing their expertise and opinions. Various topics, such as the similarities between the market entry of the AM technology and the now well-established Ceramic Injection Moulding (CIM), were discussed.

K. Scharrer reminded the audience that when CIM first appeared on the market, only a few thought that it would reach the status of conventional technology, and that AM seems to be following the same path. Pioneers in the adoption of AM, such as Dr Wampers, are experiencing their first success stories, with surely many more to come in the future.

The first day ended with a meet-and-greet at Lithoz, where enthusiastic networking

Fig. 2 Get together at Lithoz (Source: Lithoz)

Fig. 3 Prof. Jens Günster (l.), and Dr Johannes Homa (Source: Lithoz)

conversations and lively discussions took place as participants met with experts from Lithoz. It was also possible for users of Lithoz technology to pre-book a meeting and get individual advices from Lithoz professionals in the fields of chemistry, material development, processing and postprocessing.

Medical Applications

The second day started with a very interesting session concerning the medical applications of AM. Dr Günther Russmüller, a dentist and surgeon at the General Hospital of Vienna/AT, reported on **Bone Tissue Regeneration** and highlighted examples of bone regeneration and the success of using bio-absorbable ceramics in the jaw and cranial area.

Martin Reinauer (KLS/DE) gave an industrial perspective under the headline **Additive Manufactured Ceramics – a New Possibility for Innovative Implants** on the potential of AM in creating medical devices,

Fig. 4 Auditorium (Source: Lithoz)

Fig. 5 Active discussions after the presentations (Source: Lithoz)

and spoke about the possibility of digitally planning operations such as creating implant designs for dysgnathia operations. He also shared his positive experiences using patient specific implants which were made from resorbable ceramics and produced using LCM technology.

Dr Daniel Bomze (Lithoz) closed the session with the presentation **Materials and Software for Medical Applications**. He gave an outlook on new biomaterials, and the new possible software solutions for medical applications.

AM in Industry

Dr Thomas Mühler (ALUMINA SYSTEMS) talked about **Best Practice Example – Ceramic AM for the Semiconductor Industry** and presented a dispenser ring with AM printed nozzles mounted on a ceramic ring with channels, which was produced by slip casting (diameter: 30 cm). A good example how AM can be combined with traditional technologies. Additionally, he introduced a new concept for 3D-printing of large components using laser technology to fix the individual layers. Dr Homa gave a presentation on **AM Hype or Revolution** about the key drivers for AM. He highlighted that AM is already on the edge of serial production, but that many companies are still reluctant to use this technology. He also talked about the obstacles and problems related to implementing AM in industry.

Philipp Turski (INP Greifswald/DE) reported on a **Vision for AM-Ceramic Applications in Plasma Technology**, and discussed his project related to plasma technology, and shared his expectations in gaining new insights into this technology with the help of ceramic isolators.

Material esting

The last session focused on material testing, and the different approaches and possible methods of testing ceramics and other substances. It was discussed how the additive manufacturing of ceramic materials not only offers new possibilities in terms of shaping and fabricating complex and intricate designs, but also how it raises new questions and challenges concerning the testing and characterisation of materials and components produced through AM.

Uwe Scheithauer (Fraunhofer IKTS/DE) reported on **Characterisation Method for Additively Manufactured Ceramic Components** and showcased the different shapes and tilts of objects produced through AM, and how these properties can greatly affect the strength of the components. **Advancing 3D-Printed Ceramics with Correlative Microscopy** was the talk of Prof. Silke Christiansen (Helmholz Institute Berlin/DE). She measured microcracks in materials, and discussed how these measurements can be used to predict future behaviour and even bone diseases.

The final presentation was given by Dr Aran Rafferty (AMBER, Trinity College/GB). He highlighted his thorough research into the porosity of alumina relating to curing temperature under the headline **An Investigation of Open, Interconnected Porosity in 3D-Printed Alumina**.

AM Ceramics 2018 was summarised by Dr Homa: “This year’s AM Ceramics showed that some companies are really starting to employ AM in their daily business, and as a result have already experienced a number of success stories. Other companies are still in the early stages of employing AM, but they are highly interested and on the edge of starting to work with this technology.”

AM Ceramics 2019 will be held in Munich/DE, 19–20 September 2019, in the framework of the 1st ceramitec Conference, to share again experiences on different topics related to AM. KS