

Germany

Annual Meeting of the Ceramic Injection Moulding Expert Group

On 22 April 2008, the "Expertenkreis Keramikspritzguss in der DKG e. V." (Ceramic Injection Moulding Expert Group with the German Ceramic Society) was established in Hanover. The Ceramic Injection Moulding (CIM) Expert Group is a network of companies and institutes united in the objective of innovative further development of the entire process chain of ceramic injection moulding. At the annual meeting on 21.–22.03.2019 in Meissen, the attendees reflected on the activities over the last decade and took up fresh impetus for further work. In the Expert Group, partners cooperate who have the entire CIM process chain in-house and can make an active contribution to projects.



Fig. 1 CIM experts at the river banks of Elbe

Research projects

Collectively initiated technology developments, for example based on IGF projects (Industrial Collective Research for SMEs, funded by Germany's Federal Ministry for Economic Affairs and Energy), are the focus of the Expert Group's activities coupled with publicity work to communicate the advances in technology to potential users of CIM components. Most work has been initiated through IGF projects.

In 2011, with the "ProCIM" project, fundamental developmental work was conducted for the largely non-destructive testing of CIM components. These findings were later channelled into the preparation of a corresponding DKG guideline for the assessment of CIM components. In addition came the development of a disk compression test for sintered components and tests on the definition of suitable storage conditions for feedstocks.

In 2012, with the "GlasPIM" project, for the first time, a bridge was built to the manufacturers of sintered glasses. The introduction of know-how from CIM technology led to the development of suitable processes for large-scale production of glass components. An interesting finding was that, with the new process route, microstructures can be realised without etching. The work was continued in 2014 with the "2K sintered glass" project. Work was conducted on re-

cycled glass powders in some cases, with the focus being on the functionalization of components with appropriate measures during injection. One example is an intrinsically heated nozzle, e.g. for glue guns that consist of electrically conductive and insulating sintered glass.

With the work on "KombiPIM" in 2016, tape casting and CIM as well as injection moulding of "lost" core materials in one process step. With this concept, it was possible to avoid metal casings that have a different thermal expansion than the LTCC ceramics used in a pressure sensor being needed. LTCC tapes were inserted in the CIM mould, with polymer material as the component, which is burned out, defining the necessary cavity, overmoulded and then completed with LTCC material for the sensor casing.

In the year 2013, the "ExtruFol" project, which was funded by Germany's Federal

Ministry of Education and Research, had the objective of developing improved sintered plates for injection moulded components that enable faster furnace cycles with lower thermal load.

Besides tape casting, thermoplastic extrusion was used to shape the plates which then have to be marked and reshaped.

New IGF projects focus on electrodes made of titanium suboxides for cold plasmas ("PlasmaEle") for applications in the disinfection of poorly healing wounds or for purifying air. The electrodes have to have a wide variety of shapes and are therefore an interesting challenge for CIM.

In the "Hygiene First" project, the objective is the development of novel hygienic operating elements for sensitive public areas on the basis of injection-moulded sintered glass components. Here, cooperation exists with experts on wood and design, as it is a matter, for example, of fittings and handles



Fig. 2 CIM-tool developed for tests in the IGF projects



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for use in public areas in an environment where biofilms must be avoided and easy cleaning made possible.

As focuses for the future, the following issues have been defined: injection moulding of large-size components, hybrid fabrication (combination of thermoplastic 3D-printing with CIM or combination of Fused Filament Fabrication – FFF with CIM). The optimisation of the process and quality assurance is an ongoing task.

Publicity work

The fact that all members of the Expert Group have expertise at different points in the value creation chain (research institutes, machine manufacturers, materials produc-

ers and component manufacturers) adds up to a wide expert knowledge from which every individual member company can benefit. Especially the Technology Development working group is crucially driving process development forwards. For example, an injection moulding tool commissioned and fabricated by the Expert Group enables wide-ranging tests in respect of new materials and their optimised machining options and methods. In numerous bachelor dissertations and master theses, different questions have been examined and made available to the members as technology recommendations. Interesting papers by external experts, participation at trade fairs and symposia or injection moulding training

sessions for members of the Expert Group round off the cooperation and are used to increase awareness of ceramic injection moulding but also to provide training in university and field seminars.

In future, the Group wants to take up technologically interesting topics from neighbouring fields. Joint visits during members' meetings or working group meetings at other companies, e.g. hard finishing contractors, suppliers and end-users will support this work.

Contact partners are Dr Tassilo Moritz/ Fraunhofer IKTS (Chairman), Hartmut Walcher/Arburg (Technology) and Jens Graf/Kläger (Marketing). Details are available at: www.keramikspritzguss.eu



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