GERMANY

New Building for Fibre Pilot Plant Unique in Europe Inaugurated at Fraunhofer Center HTL

At the Fraunhofer Center for High-Temperature Materials and Design HTL in Bayreuth/DE, the new building for a fibre pilot plant, unique in Europe, was inaugurated on 12 April 2019. A total of EUR 20 million (including EUR 11 million for the production lines) were invested in the facility with a useful area of 2000 m^2. Speaking in front of numerous guests from politics, commerce and industry, Hubert Aiwanger, Bavaria's Minister of Economic Affairs, Andreas Meuer, Director at the Fraunhofer Gesellschaft, Brigitte Merk-Erbe, Mayor of the city of Bayreuth, Dr Markus Zanner, Chancellor of Bayreuth University, acknowledged in their welcoming addresses the major significance of the construction project for the regional ceramics and textiles industry as well as the supply of European companies with these high-quality materials. Director of the Fraunhofer Center HTL, Dr Friedrich Raether (FR), explained to us the technical and economic background to this forward-looking project.

Fig. 1
Guests at the inauguration ceremony

CA: *How important are ceramic fibres for new materials solutions and accordingly for higher performing ceramic components?*

FR: Ceramic fibres are the key to new ceramic fibre composites that can be used at high temperatures and are ductile, similar to metals. Many high-temperature processes can be realised more energy efficiently and therefore sustainably with these materials. For instance, the operating temperatures of aircraft engines can be further increased, and their CO_2 emissions reduced – their efficiency is improved, and the cooling requirement lowered; in addition the aircraft noise is reduced.

Similarly, this applies to stationary gas turbines, steam heat exchangers or solar-thermal power plants. In thermal engineering there is a multitude of applications, like hot gas valves and fans, heat exchangers, moulds and many more. With these, we achieve more energy-efficient processes and therefore more sustainable systems as CO_2 is saved.

CA: *Ceramic fibre development has already been pushed very far ahead in Japan and the USA. Is there a chance of catching up as a fast follower?*

CA: At the moment, Japan holds a leading position, but the USA is taking a very ambitious approach and wants to become world market leader based, amongst other things, on cooperative projects with Japan and France. Not to be forgotten are the strategic concepts in China where fibre development is being advanced very systematically.

The competition is fierce; already today the ceramic fibres produced in East Asia and North America are only available on a limited basis for European manufacturers and users of fibre composites (export is restricted) so that it becomes enormously important in terms of strategy to become independent. The global market for CMCs is currently valued at more than EUR 1,5 billion, however, growth rates of around 14 % per year are forecast.

With two production lines – one for oxide and one for non-oxide ceramic fibres, we will be able to produce fibres on a scale of several tonnes per year. The first line will go into operation at the end of 2019. The employees at the Fraunhofer Center HTL have been developing both non-oxide and oxide ceramic fibres for almost 20 years and can produce these successfully on lab scale. We are able to realise all process steps in the process chain – fibre synthesis, textile processing, matrix formation, finishing, coating and joining, including high-temperature measurement methods and computer simulation methods for component fabrication and behaviour in service. We already have established industry cooperation partnerships with companies (e.g. BJS Ceramics/DE, MTU/DE, Schunk/DE, Brembo/DE), as they support not only market-driven fibre development but also component development of CMC high-performance materials. The new pilot plant will open the door to other industry and research partners.

CA: *What development goals do you have on the agenda?*

FR: We have already developed an efficient fibre coating method, and the industrial application of this will lead to other interesting fibre qualities. The process is more efficient than CVD-based systems.

In addition, widening the assortment of fibres is important to adapt the fibres precisely to requirements in application.

Fig. 2
Dr Friedrich Raether welcoming the guests

For example, new types of fibre are to be developed for even higher service temperatures. It is important to advance process development to synthesize CMCs in automated procedures. We have an established prepreg technology and gentle siliconization process with which we can efficiently produce semi-finished products, which is important for the development of new low-cost CMC types. Another topic is the load-conforming arrangement of fibres in novel 3D-fabrics. Here we benefit from the expertise of our colleagues at TFK in Münchberg/DE. The Application Center Textile Fibre Ceramics TFK is a cooperation between the Fraunhofer-Gesellschaft and Hof University/DE. Here, high tech weaving machines are currently being installed, with which such components can be fabricated, and we have support from colleagues with dedicated know-how from the textile industry. It is therefore clear why Upper Franconia is so advantageous as a base.

CA: *Thank you for talking to us.* KS

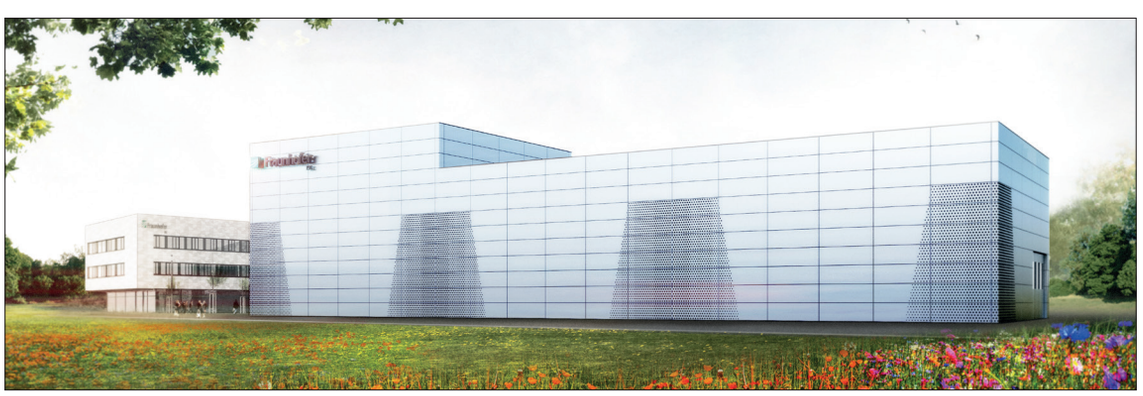

Fig. 3
The new fibre pilot plant building (Visualisation: KSG Architekten)