

# Foreword

*Prof. Alexander Michaelis*



## **Dear friends and partners of IKTS,**

in this annual report, we once again look back on a successful and eventful year. Compared with the previous year, our total budget increased by €5.9 million to a record level of now €96.7 million. This involves significant investment in our infrastructure using part of our institute's technical reserve. This equipment and, above all, our excellent IKTS team of experts are ready to assist you in joint projects. Our expertise continues to cover the entire value chain of technical ceramics up to the upscaling range for materials, components and complete systems. These competencies are completed by characterization and non-destructive testing technologies optimized to fit customer requirements.

One focus of our current investments is on setting up a pilot line for the series production of high-temperature electrolysis and fuel cell stacks (SOEC/SOFC) at our site in Arnstadt. We have thus laid the foundation for a major industrial project and a strategic partnership with thyssenkrupp nucera. Dr. Roland Weidl and his teams are responsible for the demanding overall coordination of this major project. Together, we will implement the large-scale production of SOFC/SOEC modules into the

GW scale and thus address the market for the production of low-cost green hydrogen. With its industrial plants for alkaline electrolysis, thyssenkrupp nucera is already the world market leader in this field. In our strategic partnership, the company will now diversify into high-temperature electrolysis SOE and will therefore be able to further expand its technological and market leadership. SOE offers efficiency benefits by being able to use waste heat, which can reduce the electricity required for hydrogen production by more than 30 %. Another essential advantage of SOE is its co-electrolysis capability. In addition to hydrogen, green synthesis gas ( $H_2 + CO$ ) can also be generated. For this purpose,  $CO_2$  is removed from the environment (e.g. from exhaust gases of cement plants) and coupled into the electrolysis. The synthesis gas can then be coupled, for example, with the Fischer-Tropsch process in order to produce e-fuels, such as SAF (sustainable aviation fuel). Further examples of the coupling of SOE to chemical processes include the Haber-Bosch process for the production of ammonia ( $NH_3$ ), and the production of green steel. At Fraunhofer IKTS, numerous projects in this vein are already underway in the departments of Dr. Mihails Kusnezoff and Dr. Matthias Jahn, making us a world leader in this field.

Another example of ecologically and economically advantageous system developments is the "ReCoSiC" process, developed in the department of Jörg Adler. Compared with the conventional Acheson process, it not only drastically increases the yield of high purity SiC (from below 40 % to almost 100 %), but also reduces CO<sub>2</sub> emissions by more than 75 %. This process is now being implemented industrially by our industrial partner ESK-SiC GmbH, which was recently acquired by the Schunk Group. We will continue to drive the topic of high-purity SiC into single crystal production for high-performance electronics. We are thus also contributing to Germany's security of supply in this area. We have raised project funds for this from the State of Saxony.

Managing such large-scale projects is a considerable challenge for us, which we are happy to face because it enables us to demonstrate our system relevance as a driver of innovation for Germany and to show that we at Fraunhofer are successfully fulfilling our mission of bringing our technological developments to the industry. Such success would not be possible without federal state and federal government support. In turn, our host states also benefit considerably from our work. In addition to the above-mentioned project with thyssenkrupp nucera, which is taking place mainly in Arnstadt, we have made a significant contribution to the establishment of the battery companies CATL in Thuringia (Arnstadt) and Altech GmbH in Saxony (Schwarze Pumpe). In this context, I would also like to mention a "smaller anniversary" for us in Thuringia:

15 years ago, we joined forces with the Hermsdorfer-Institut für technische Keramik (HITK) and fully integrated it into Fraunhofer IKTS. To quote Prof. Ingolf Voigt, who concisely summarized this success story:

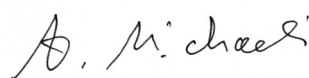
- The property in Hermsdorf was expanded with technical centers 3, 4 and 5.
- A new location in Arnstadt was added, which acts as an industrialization and digitization site for the entire Fraunhofer IKTS.
- The workforce in Hermsdorf grew from 120 to 200 employees.
- The total budget of the Hermsdorf site more than doubled.
- There are stable university connections with Friedrich Schiller University Jena and Ernst Abbe University of Applied Sciences Jena.
- The tape casting technology resources were expanded into the tape casting center of IKTS.
- In addition to oxide ceramics, functional ceramics and ceramic membranes, stationary energy storage systems are the fourth strong materials-related focus at IKTS Hermsdorf.
- The R&D center for transparent ceramics is in operation in Hermsdorf.

- The ceramic membranes for gas separation are about to be commercialized (spin-off of POXOS GmbH).
- The membrane process technology is supplemented by the Reaction Engineering Water Group and a new laboratory area.
- The chemical analysis of ESA Eidam & Seiferling Analytik GmbH is integrated into Fraunhofer IKTS and works on behalf of the ceramic companies and the sister sites of IKTS.
- With the Tridelta Campus Hermsdorf e. V., we have formed a strong network with the region's ceramic and technology companies.

A similar list of successes can also be created for our other 14 locations. Without wanting to exceed the scope of this foreword, I should at least mention our very latest location in Halle, where we have taken over a division of the former Fraunhofer IMW, including its site. The team, led by department head Dr. Daniela Pufky-Heinrich, perfectly complements our value chain with the topic of how to assess technology under socio-economic aspects. This means we now also have a presence in Saxony-Anhalt and have transformed into a true Central German institute.

In the report, you will find further highlights and development trends from our business divisions. On behalf of the entire IKTS team, I wish you once again a lot of fun perusing this report and some good project ideas. We are looking forward to our mutual cooperation.

Yours,



Alexander Michaelis

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