



Fraunhofer

IKTS

FRAUNHOFER INSTITUTE FOR CERAMIC TECHNOLOGIES AND SYSTEMS IKTS



BUSINESS DIVISION

WATER





WATER

Water is an important resource in manufacturing and as a foodstuff. It is therefore paramount that our water is used efficiently and protected from contamination – for economic as well as ecological reasons. Fraunhofer IKTS provides solutions for the treatment of waste water and industrial process water without chemicals or biological agents – from multifunctional components to compact overall systems.

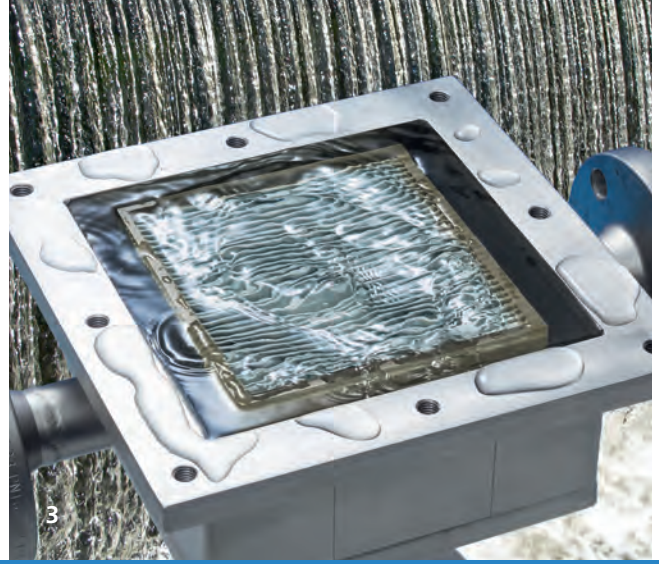
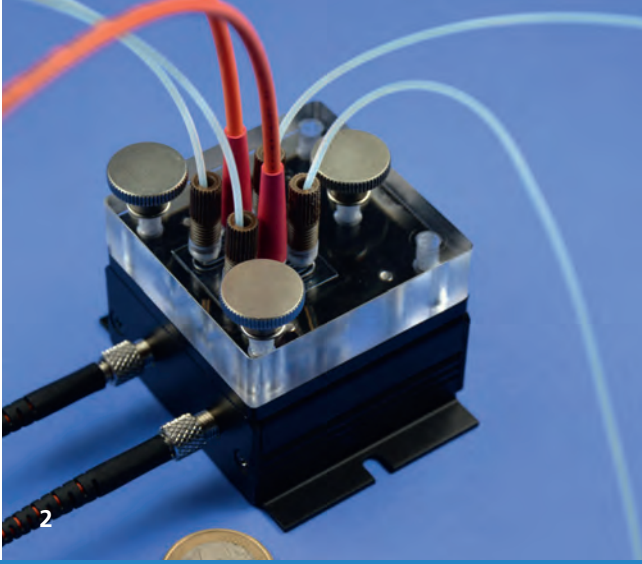
Fraunhofer IKTS has many years of experience in identifying and solving specific problems faced by the industrial and household water management sectors. Based on extensive process analyses, we apply the advantages offered by ceramic high-performance materials to the development of functional components in separation and reaction technology. Our scientists integrate these components in economical system solutions used by municipal water works, the manufacturing industry and the mining sector. The disciplines of materials technology and process technology are closely intertwined at Fraunhofer IKTS in order to meet all relevant technological, statutory and economic framework conditions.

Our successful methods focus on combining ceramic membranes for micro-, ultra- and nanofiltration with electrochemical, sonochemical and photocatalytic processes (advanced oxidation processes – AOP). Specific sensor systems and classic aerobic and an-aerobic treatment techniques also play a role in many cases. The institute develops highly integrated components which combine processes such as filtration and adsorption or sonoelectrochemical oxidation. The sensors required for this are developed and integrated specifically for each application. Ceramic elements are key when it comes to improving the performance of such highly integrated compact systems as well as the operating conditions (high temperatures, aggressive media). The combination of these methods significantly reduces the energy demand of water treatment plants

and enables the use of renewable energy sources. This makes process technology more efficient and benefits the environment while reducing process costs.

As a reliable partner for industrial and municipal clients, Fraunhofer IKTS also dedicates its resources to meeting the challenges of the future. Due to changes in demography, legislation and economic framework, water and waste water systems will have to become smarter and more efficient. For this reason, Fraunhofer IKTS integrates cutting-edge measuring and sensor technology concepts to operate plants adaptively and in an optimized way depending on the load. Furthermore, it is possible to adapt centralized and decentralized water treatment solutions to specific local demands and conditions by integrating modular plant concepts and using powerful data collection and interpretation strategies (AI, neural networks).

With its business division Water, Fraunhofer IKTS is working at the crossroads between the water, energy and materials management sectors. For instance, requirements from sectors such as heating, renewables, nutrients and raw materials can be integrated in approaches for holistic systems used to balance ecological and economic requirements.



AREAS OF APPLICATIONS

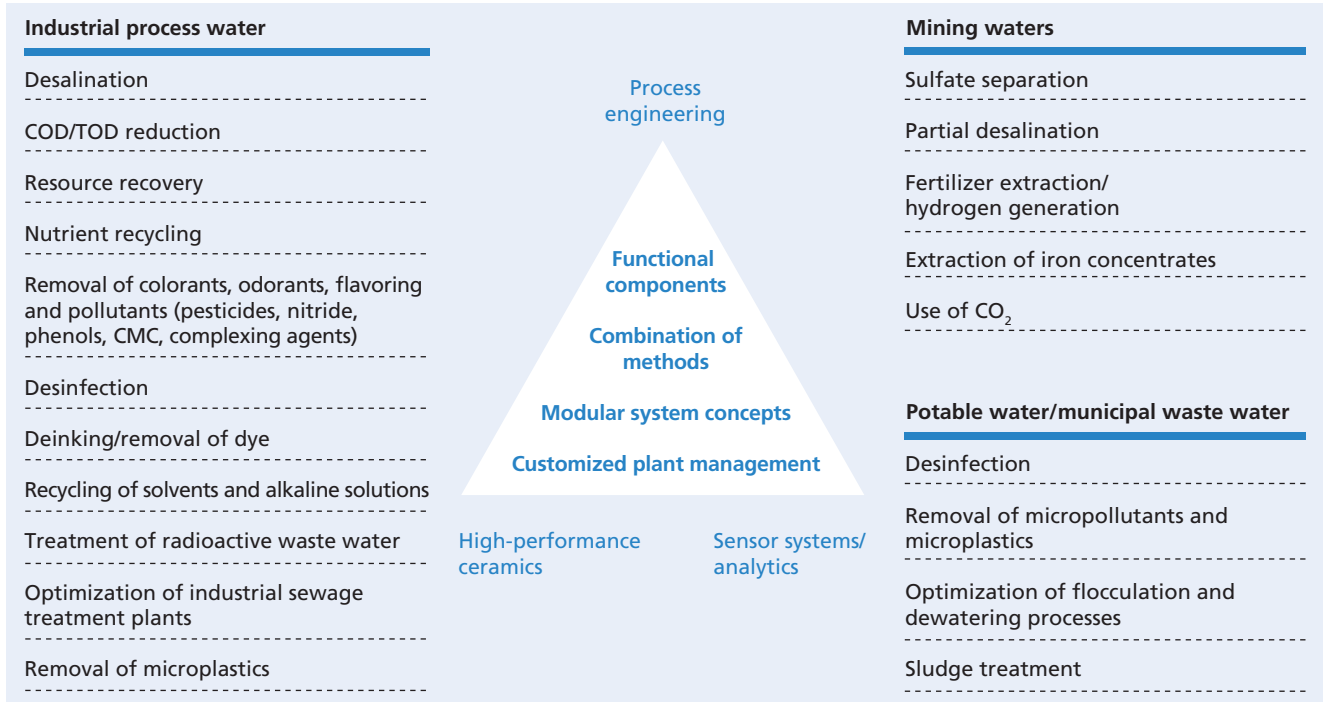
Industrial process water

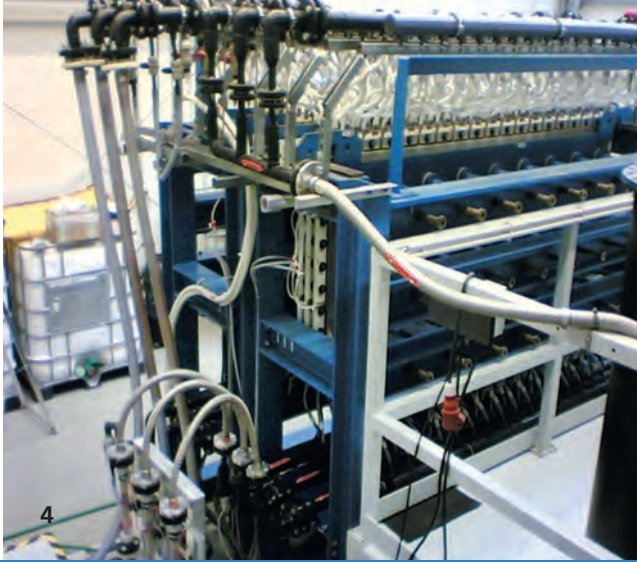
Industrial process waters are highly industry- and company-specific with regard to their composition, accumulation characteristics as well as the required treatment targets. Their treatment often requires complex technology combinations.

Fraunhofer IKTS offers a wide spectrum of services – from the analysis of process and requirements to the development of methods supported by experiments and the transfer of treatment plants to practical operation on the pilot scale. The institute makes use of its extensive project experience gained in the chemical, petrochemical, foodstuff, ceramic, textile and paper manufacturing fields and other processing industries.

Municipal waste water

Today, the most urgent challenge faced by centralized and decentralized municipal waste water treatment lies in establishing strategies and powerful methods for the retention or elimination of anthropogenic micropollutants and their transformation products while keeping costs at acceptable levels. Among other things, such methods are key to containing the spread of multiresistant pathogens in the environment. Beyond this, IKTS supports municipal operators in reducing the energy demand and costs of existing processes such as activation or sludge treatment without losses in performance. At the same time, the institute integrates specific technologies to recover important resources, such as phosphor. IKTS has several technological solutions in these fields, all of them proven in collaboration with various partners.





Potable water

In developed countries, potable water is the one foodstuff with the strictest standards of supervision; it can therefore be consumed without hesitation. New challenges in raw water treatment result from rising nitride contents in groundwater, pesticides in surface water, and the increased risk of bacteriological contamination of distribution systems due to rising ambient temperatures in the context of climate change. On a global scale, the extensive and sustainable supply of humans and agriculture with microbiologically safe water is the most pressing issue. Since more and more fresh water resources from ground-water and surface water are at risk of overuse, re-use strategies and desalination technologies are gaining in importance. IKTS has the technological components (electrodes, AOP processes, sensors, membranes, combined systems) and application know-how to rise to these challenges.

Mining waters

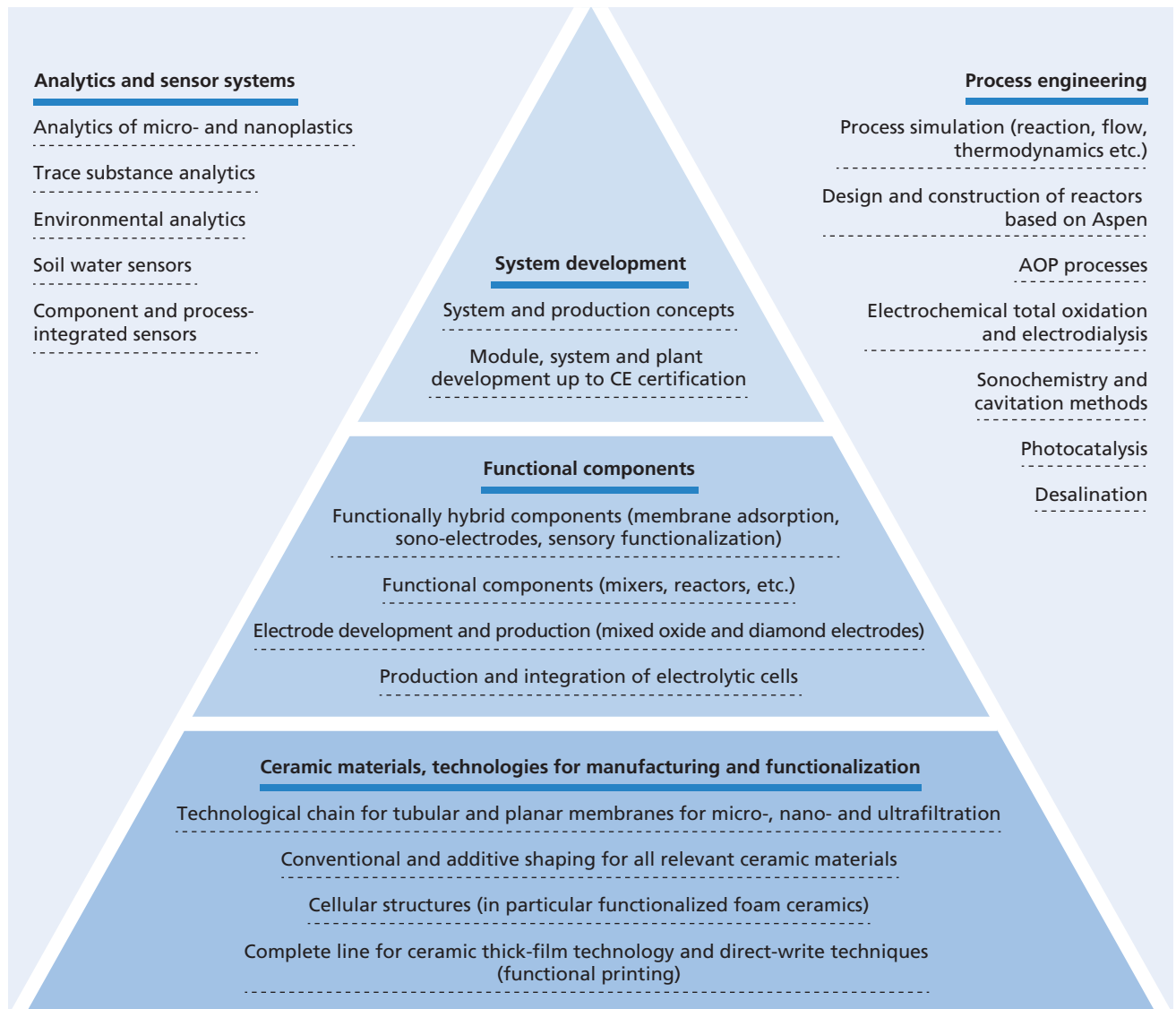
All over the world, mining operations cause extensive and massive damage to landscapes and profoundly affect the water balance of whole regions. The consequences for water resources and water quality are felt not just during the active production phase, but in many cases for years after mining activities have stopped. Due to natural disintegration, the available water in such areas is contaminated with a number of substances of geogenic origin. One frequently encountered phenomenon – even in Germany – is high concentrations of sulphate contaminating the water supply.

IKTS has conducted many years of research in this field and developed unique electrochemical processes (e.g. Rodosan®) for the treatment of mining water, including the pertaining technical equipment. These processes are available and highly mature. They can be combined with technologies from the agricultural and energy sectors. They even make it possible to produce fertilizers, hydrogen and other valuable products with renewable energy, for use in decentralized resource cycles. This increases the added value of companies and economic regions as a whole.

- 1 *Photocatalysis module for the treatment of potable water.*
- 2 *Analysis system for pollutants and trace substances in municipal waste water.*
- 3 *Filter module with ceramic flat membranes for the purification of industrial waste water.*
- 4 *Pilot plant for the electrochemical sulphate separation in mining water.*



EXPERTISE



FRAUNHOFER IKTS IN PROFILE

The Fraunhofer Institute for Ceramic Technologies and Systems IKTS conducts applied research on high-performance ceramics. The institute's three sites in Dresden (Saxony) and Hermsdorf (Thuringia) represent Europe's largest R&D institution dedicated to ceramics.

As a research and technology service provider, Fraunhofer IKTS develops modern ceramic high-performance materials, customized industrial manufacturing processes and creates prototype components and systems in complete production lines from laboratory to pilot-plant scale. Furthermore, the institute has expertise in diagnostics and testing of materials and processes. Test procedures in the fields of acoustics, electromagnetics, optics, microscopy and laser technology contribute substantially to the quality assurance of products and plants.

The institute operates in nine market-oriented business divisions to demonstrate and qualify ceramic technologies and components as well as non-destructive test methods for new industries, product concepts and markets beyond the established fields of application. Industries addressed include ceramic materials and processes, mechanical and automotive engineering, electronics and microsystems, energy, environmental and process engineering, bio- and medical technology, non-destructive testing and monitoring, water as well as materials and process analysis.

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COVER *Pellet reactor for the
anaerobic treatment of industri-
al waste water.*