Editorial

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In 2020, Empa, the ETH Domain's interdisciplinary research institute for materials science and technology, celebrated its 140th anniversary. According to its vision – Materials and technology for a sustainable future – the institute fulfills a bridging role between fundamental research and practical applications. By connecting partners from industry and research, Empa scientists play a key role in the innovation process in Switzerland. This is the basis of Empa's leading position in applied research and technology transfer. Empa thus makes a significant contribution to further strengthening the innovative power and attractiveness of the Swiss economy in an increasingly competitive global environment.

Empa develops solutions for the pressing challenges facing industry and society in the areas of secure and green energy supply, conservation of the environment, responsible handling of resources as well as human well-being. Empa strives to address these challenges with innovative materials science and technology, focusing on nanostructured, smart materials and surfaces, construction and environmental technologies, as well as medical technologies and personalized medicine. As an example, Empa researchers are currently working on the 'ReMask' project together with a nationwide consortium from research, healthcare and industry. Innovative masks for efficient protection against viruses and technologies for the reuse of protective materials are being developed – for now, but also for future pandemics.

Providing a sustainable energy supply for an ever-growing demand is another core area of Empa's research, which requires not only new types of building concepts and carbon-neutral building materials, but also energy-efficient and resource-saving materials for energy conversion and energy storage. These few examples highlight that materials science and technology development at Empa is not only based on scientific excellence, but also on a holistic approach combining basic research with practical applications including life cycle analyses, recycling and reuse concepts. This approach relies increasingly on data-based science, machine learning, artificial intelligence and digital twins.

The unifying element of our activities is the development of new materials leading to novel functionalities. Materials integration and transfer to dedicated applications requires a fundamental understanding of the respective structures and impacts on design for optimized and, more importantly, reliable systems.

In this sense, we organized this issue focusing on new applied materials and systems and related analytical research for structural understanding highlighting Empa's strengths in this domain, from the atomic scale to the macro-world, bridging fundamental research and real-world applications.

The understanding of chemical reactions and the development of novel synthesis routes together with analytical tools to study reaction kinetics (***Borgschulte et al***. & ***Stolz et al.***, this issue) is the foundation of materials research on the atomic level. The contributions of ***Stuer et al.*** and ***Cancellieri et al.*** (this issue) focus on the microstructure–properties relationship and the design of favorable microstructures *via* controlled synthesis routes. Tailoring the microstructures allows the design of functional organic materials such as fibers (***Schoeller et al.***, this issue) and nanomaterials (***Buljan and Wick***, this issue), which allow fascinating new medical applications. The contributions of ***Shahverdi et al.*** and ***Batt et al.*** (this issue) bridge to the macroscopic world of engineering materials and real-world applications that are already on their way to enter the market.

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