

## Editor's Preface

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It is a great honour for me to introduce KONA Powder and Particle Journal No. 41 as the recently appointed Chair of the European and African KONA Editorial Board and the successor of Gabriele Meesters, whom I would like to thank for his great commitment to KONA. Since my doctoral thesis on ultrafine wet milling over 40 years ago, I have been part of the journey of particle and powder technology. From predominantly basic research on unit operations of grinding, granulation, classification, and mixing, including powder flow and particle size characterization, the research focus has moved first to in-depth research on the behaviour and interaction of individual particles and more recently to the deep investigation of full process chains and the production of complex particulate products with optimized properties. During this journey, the design of functional particles and complex particle structures has become increasingly important, with strong interaction with materials science. An expression of this is the development of nanoparticle technology, especially in the first decade of this century, and the design of complex particle structures for energy storage, conversion, and generation, especially in recent years. Accordingly, my research has shifted from the production of nanoparticles to the processing and design of energy and pharmaceutical materials, always based on a deep understanding of particle behaviour within individual processes.

I am very happy that in the post-Corona period, we can meet again with our particle technology colleagues and friends around the world at conferences or KONA board meetings to further our common interests. It was a pleasure to meet so many colleagues and friends during 2022 at various conferences, especially the World Congress on Particle Technology in Madrid (Spain) and Chops in Salerno (Italy), although these conferences were still influenced by Corona as quite a few participants were infected at the conferences. In 2023, the European conference highlight was PARTEC 2023 in Nuremberg (Germany), with the overarching theme “Particle Technology for Sustainable Products”, addressing the increasing importance of sustainability and circular economy due to climate change. As the PARTEC 2023 Chair, it was an honour and a pleasure for me to welcome over 500 colleagues from 25 countries, who enjoyed more than 300 plenary, keynote, regular and flash presentations and experienced the diversity of our research field. Overall, the presentations at PARTEC 2023 show the importance of particle technology across all industries. Today, particle technology plays an important role not only in classical industries such as chemical, pharmaceutical, food, and minerals industries but also in dynamically developing industries of energy transition with products such as batteries, solar panels, and fuel cells. Moreover, numerical simulation and digitalisation are becoming more and more important. Overall, I see a clear trend that particle technology is becoming increasingly interlinked with other technologies and communities:

First, the importance of design, synthesis, and processing of particulate energy materials rises significantly due to the global energy transition towards 100% use of renewable energy resources and minimisation of the CO<sub>2</sub> footprint. Even today, the production, processing, and recycling of active materials for lithium-ion batteries require in-depth knowledge of particle technology in addition to materials science, electrochemistry, and production engineering. Particle technology is even more important for solid-state batteries, which are the most promising new generation of



batteries. Here, particulate solid electrolyte particles made of sulphides, halides, or oxides have to be produced and processed together with the active material particles and other components in such a way that high ionic conductivity and long cycle life are achieved.

Second, the production of innovative products such as battery cells, solid pharmaceuticals, functional coatings, and additively manufactured products requires close cooperation between particle technology and production engineering, as well as cooperation with relevant technology areas. A relatively new and emerging field is additive manufacturing, where particles need to be produced, tailored, e.g., with nanoparticle coatings, and recycled. In addition to metal- and polymer-based particles, mineral particles for additive manufacturing in construction are also current areas of research.

Third, for the numerical simulation and digitalisation of processes and products using particles, the Particle Technology Community works with scientists and experts from mathematics, physics and computer science. As a result, numerical simulation using discrete element methods (DEM) is becoming increasingly powerful and can now simulate even larger industrial problems. In addition, DEM is increasingly being combined with other simulation methods such as computational fluid dynamics and population balances. More recently, artificial intelligence methods have been used to predict process results and product properties based on relatively large datasets.

In addition to inter- and transdisciplinary collaborations, I see increasing international collaboration within our particle technology community as an important goal for the future, despite the increasing conflicts between countries that we see today. In addition to international conferences, the funding of joint research projects with partners from different countries is an important measure and should be strengthened in the future. There are also international organisations such as the International Fine Particle Research Institute (IFPRI) or more technology-oriented associations such as the Global Comminution Collaborative (GCC), the International Delegation on Filtration (INDEFI) or the Association pour l'Etude de la MicroMécanique des Milieux Granulaires (AEMMG). Such global scientific organisations not only promote international research cooperation but also an intensive exchange between science and industry, and a general understanding between nations.

This issue of KONA continues the trend of previous issues towards the publication of more high-quality review articles alongside forward-looking original articles from many countries. Accordingly, journal metrics such as the impact factor, which is now above 4, have developed very positively recently. The increased focus on high-quality review papers is sure to further enhance KONA's reputation. This issue contains 12 high-quality review papers and 5 original papers by 54 authors from 11 countries. Five papers focus on modelling and numerical simulation, 2 on energy materials, and one on additive manufacturing, the three emerging areas mentioned above. Further 5 papers focus on fundamental operations, including powder and multiphase flow, and 2 papers each on the characterisation and synthesis of particle systems.

Finally, I would like to thank all the authors and reviewers for their hard work in preparing and optimising the papers, as well as all those who have contributed to the realisation of this "KONA Powder and Particle Journal" Issue No. 41.

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October, 2023