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# Editorial

## Special Issue on Functional Dielectrics

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Functional materials, most of which are dielectrics, are the foundation for various sensors, actuators, and transducers, as well as energy conversion and storage devices. Functional dielectrics play a critical role in the current industry and will play a more important role in the next generation high-tech devices and systems. Polymer-based functional dielectrics exhibit some unique properties, such as flexibility, light, standing with high mechanical impact, all of which make polymer-based functional dielectrics more suitable for many applications, such as wearable electronics and devices.

Prof. Dr. Reimund Gerhard has been playing a leading role worldwide in, and has made significant contributions to, the development of polymer-based dielectrics. He served as the President of IEEE DEIS (Dielectric and Electrical Insulation Society) and many office positions at professional societies and chaired many international meetings/conferences related to dielectrics. He was elected as Fellow of IEEE and APS (American Physical Society). Prof. Dr. Gerhard and Prof. Dr. Zhongyang Cheng started to establish a technical committee (TC) under IEEE DEIS — Technical Committee on Functional Dielectrics[1] to tackle the challenges facing the research, development, and applications of functional dielectrics and to prompt the research and development of functional dielectrics and the collaborations among scientists and engineers from different community and nations.

On the occasion of his 70th birthday (May 2022), the TC on Functional Dielectrics/Materials and the editorial office of Journal of Advanced Dielectrics made the decision to publish a special issue on functional dielectrics to celebrate his great contributions to functional dielectrics and to prompt the research and development of functional dielectrics.

In view of the special issue, Prof. Dr. Sidney Lang from the Department of Chemical Engineering at Ben-Gurion University of the Negev, Israel describes his association with Prof. Dr. Gerhard as follows:

"It is a great pleasure to congratulate Prof. Dr. Reimund Gerhard on the occasion of his 70th birthday. Reimund is a world-class scientist whose research has led to major developments in the field of polymer electrets. The greater part of his distinguished career was at the University of Potsdam (Germany) where he became a full professor in the Department of Physics in 1997 and eventually served as Dean of the Faculty of Science from 2008 to 2012. There he directed outstanding research teams of graduate and postdoctoral students who made major contributions to our knowledge of polymer electrets with emphasis on their piezoelectric, pyroelectric, and dielectric properties and applications. A number of his students have become department heads at universities in Europe, Asia, and North and South America."

"Reimund has a remarkable warm and open personality that endears him to both students and senior colleagues. He has a very broad range of knowledge outside of scientific topics and a remarkable ability to analyze complex situations. I met Reimund for the first time at a conference in Europe in 1983 and we quickly became good friends. He invited me to work in his laboratory a number of times. There I had an opportunity to observe the way in which he developed new research ideas. He had an effective way of directing students that also allowed them independence. He is the epitome of a good mentor. On warm summer days he would buy ice cream for all of the people in his lab and take them for a walk around the beautiful campus of the University of Potsdam. The warm atmosphere that pervaded his laboratory contributed to its high degree of productivity. Reimund's laboratory ranks among the best in the world in its field."

"Reimund is an accomplished musician. The attendees at many conferences will recall Reimund's flute concerts, often accompanied by the piano played by his wife, Christine."

"Congratulations Reimund on a remarkable scientific career. And even more so, for the warm friendship that you share with many of us."

This special issue includes 10 contributions authored or co-authored by Prof. Dr. Gerhard's former students, friends and colleagues who are working in different research areas of dielectric materials in both academia and industry around the globe.

Ferro- or piezo-electrets are an important class of dielectric materials which though nonpolar show similar ferroelectric properties as conventional electret materials. The review articles by Qiu *et al.*[2] and Altafim *et al.*[3] summarize the important research on ferroelectrets.

The resonance phenomenon in dielectric materials is highlighted in the work of Gidion *et al.* by reviewing and comparing the acoustic and electromagnetic modes in resonators.[4]

The article by Zhao *et al.* discusses the piezoelectric properties of lead-free sodium bismuth titanate epitaxial thin films, which were grown onto oriented Nb:$SrTiO_3$ substrates for actuator applications.[5]

The work of Ploss *et al.* looks into the effect of filtration of a P(VDF-TrFE) copolymer solution by studying the structure and the ferroelectric properties of spin-coated thin films prepared from the copolymer.[6]

Schwödiauer *et al.* in their article introduce a new noncontact method to measure pyroelectric coefficient of dielectric materials in an easy and highly accurate way by measuring the thermally induced pyroelectric surface potential variation of the samples.[7]

The review by Tofail on ferroelectric behavior in biological systems emphasizes on knowing the molecular and crystalline structure of biological building blocks in order to avoid misinterpretation of results in ferroelectric measurements.[8]

Wu *et al.* have systematically investigated the impact of incorporating oxygen containing ether and carbonyl groups in the polymer backbone of cyclic olefins by measuring the dielectric constant and band gap of three different poly(oxa)-norbornene polymers.[9]

The research work of Chen *et al.* deals with the preparation and study of energy storage properties of $NaNbO_3$-based ceramics.[10]

Finally, Kalbitz shows in his paper how the basic electric characteristics can be interpreted from impedance and capacitive measurements and correlates them with equivalent circuits for different capacitor technologies.[11]

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