# Material science and interfacial analytics for energy and sensing applications

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Elizabeth von Hauff was appointed the director of the Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP and Professor in Electrical Engineering at the TU Dresden, Chair of Coating Technologies for Electronics in 2021. Her research interests lie in fundamental questions in physics and chemistry within the context of real applications. She will present an overview of her work on impedance spectroscopy for energy and sensing applications and introduce the vision for future work at the TU Dresden and the Fraunhofer FEP. Functional interfaces are at the heart of solid state and electrochemical energy conversion technologies, such as solar cells and batteries. Impedance spectroscopy is well suited for studying in-situ interfacial dynamics and electronic structure in these devices, and can be applied as a diagnostic tool to identify performance losses under different operational conditions. In the case of solar energy conversion, combining electrical techniques, such as impedance spectroscopy, with steady-state and time-resolved optical spectroscopy can offer complementary insights into dynamics related to fundamental processes and loss mechanisms. As an outlook, arguments for considering non-equilibrium dynamics as fundamental signatures in energy conversion, and the role of spectroscopic tools for identifying these dynamics will be presented.

Dr. Žukauskaitė joined the TU Dresden and Fraunhofer FEP in 2022 as a senior researcher. She will present her work on application inspired material research, specifically – on sputtered aluminum scandium nitride and its use in surface acoustic wave (SAW) technology that offers a variety of applications from RF filters for mobile communication to biosensing. The medium through which the acoustic wave will travel is the key component in a SAW device. The mechanical, piezoelectric, and structural properties of the chosen material will affect the frequency, bandwidth, and quality factor of a SAW device. The wave is confined close to the surface, so due to lower production costs and easier manufacturing, thin piezoelectric films are widely used here. The emergence of AlScN in 2009 – a material with enhanced electromechanical coupling and piezoelectric properties – had a huge impact on recent thin-film based SAW research. AlScN is also CMOS compatible, high-temperature stable, and shares many other advantages of well-established parent material system AlN, making the transition to a new technology easier. The unique possibilities for future material and device development offered by such novel ternary nitrides will be discussed.