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ABSTRACT

Automated Analysis of Impedance Spectroscopy Data

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The charge transport mechanism and the macroscopic dielectric permittivity in functional materials often consist of several contributions, for example interface and intrinsic film contributions in mono- or multilayer structures, or grain boundary and intrinsic bulk contributions in functional ceramics. Temperature dependent impedance spectroscopy is shown to be a powerful tool to account for and model such behaviour by the establishment of an appropriate equivalent circuit, which leads to deep insights into the nature of the respective charge transport mechanism and the dielectric permittivity. However, the main roadblocks to a more frequent application of impedance spectroscopy are the complexity and the time requirements for a thorough data analysis process by equivalent circuit fitting. Analysing and fitting large amounts of frequency and temperature dependent impedance spectroscopy data requires restructuring the measured data, importing the restructured data into a suitable equivalent circuit fitting software, establishing the equivalent circuit, fitting the restructured frequency dependent data to the equivalent circuit at each temperature, plotting the fitted parameters vs temperature, and plotting the raw data together with the overlaid fitted curves in different notations, which all should then lead to presentable and publishable figures. In this talk I will present a multi-component software that has been developed over the last years in cooperation with a professional programmer. The software allows the completion of all analysis steps mentioned above within a few minutes, producing publishable figures.