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Methods to Decrease Error in Conductivity Measurements of Highly Disordered Materials

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Abstract

By developing a low-noise, high-voltage battery power supply, system noise has been reduced, increasing accuracy of conductivity measurements of highly disordered insulating materials. The method involves a simple parallel plate capacitor setup with the sample sandwiched between electrodes, a voltage potential applied to one electrode, and a measurement device applied to the back electrode measuring current. Previous methods involved use of a commercial power supply with a claimed low noise and high linearity, but with a low AC output ripple. At high voltages (1000 V), however, the noise became apparent in the readings and an unacceptable uncertainty was introduced in our precision conductivity measurements. Through the use of a stable dc battery high-voltage power supply, we were able to reduce noise in current measurements and achieve a more accurate measurement of conductivity for various samples.