

EIS studies in incandescent lamps' tungsten wires

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Incandescent light bulbs, in addition to providing illumination, are useful from the context of basic and teaching basic physics to engineering, multi-physics and chemistry, as many other application driven applications. The electrical properties of incandescent lamps' W-wires are revised. It is based on two new experimental observations. One is the valuable information retrieved from the measured non-zero phase φ between voltage V and current i that registers in complex impedance $Z (=V/i)$. The other is the DC voltage V_{DC} background polarization used for DC power supply ensuring a constant temperature profile conditions in W-wires during the measurement of $Z(f)$ spectra. The frequency f of importance is in the wide range of 10^{-3} to 100 Hz and the phase (Z_φ) is in the "capacitive" range from near zero values to -90° . The maximum dynamic capacitive charge behavior, before lighting, was applied from HP in an innovative commercial (1955) AC function generator model HP200A helping HP to grow from a spin off (1954) to a big company we know today. This job will provide us the experimental tools to understand the electrical behavior of incandescent lamps' W-wires upon lighting, before lighting and the critical conditions just before lighting.