

Electrical Characterization of $g\text{-WO}_{3-x}$ Materials and Devices using Impedance Spectroscopy (IS)

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Polymorphic tungsten trioxide (WO_{3-x}) is used in $\text{O}_3/\text{CO}/\text{NO}_x$ chemical gas sensors and solar cell components. Tungsten trioxide is oxygen deficient, which gives it n-type semiconducting properties. The material also exhibits photo chromic properties, which are closely related to its chemical stoichiometry. The level of non-stoichiometry is dependant on sintering conditions and can be characterized by Impedance Spectroscopy (IS) measurements (Fig. 1). This includes complex impedance (Z^*) to investigate material microstructure using RC equivalent circuits and complex permittivity (ϵ^*) to ascertain phase dependant dielectric properties. This study will focus on the microstructure and electrical properties of WO_{3-x} thick-film sensors and pressed pellets. Electrical and physical characterization techniques such as Impedance Spectroscopy (1mHz-32MHz), DC conductivity, near origin I/V tests, SEM/TEM/XRD will be used to investigate responses to different sintering regimes and dopants to optimize sensitivity and selectivity towards the target gaseous species. This study is sponsored by Capteur UK.

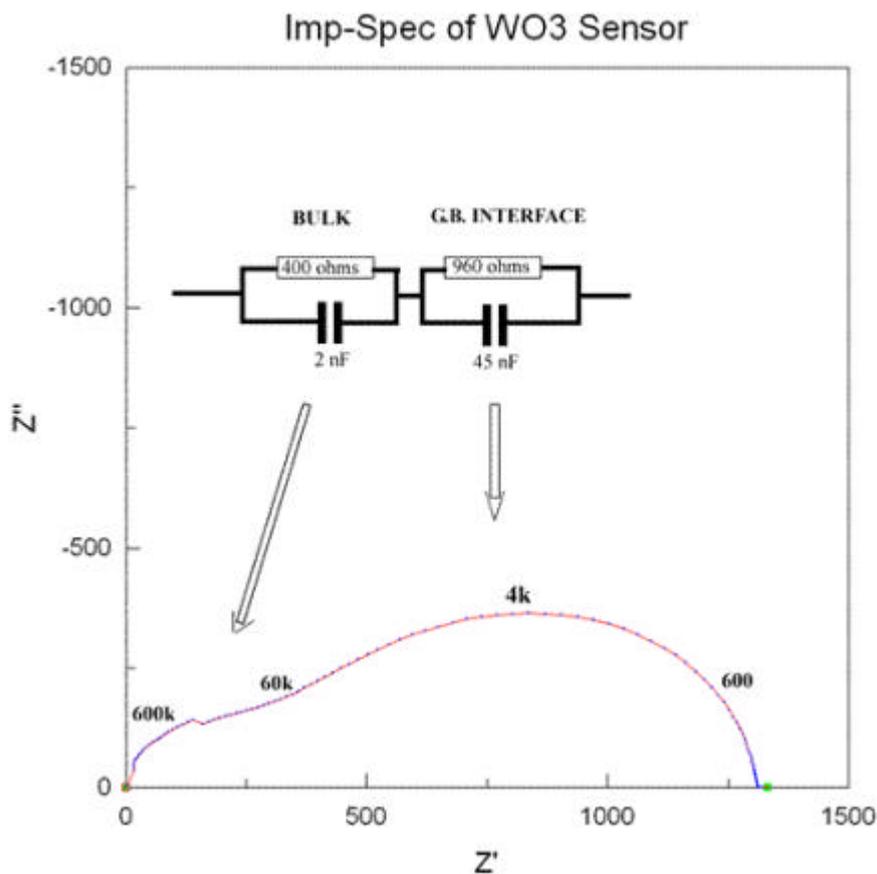


Figure 1: Cole-Cole plot of WO_{3-x} gas sensor at room temperature