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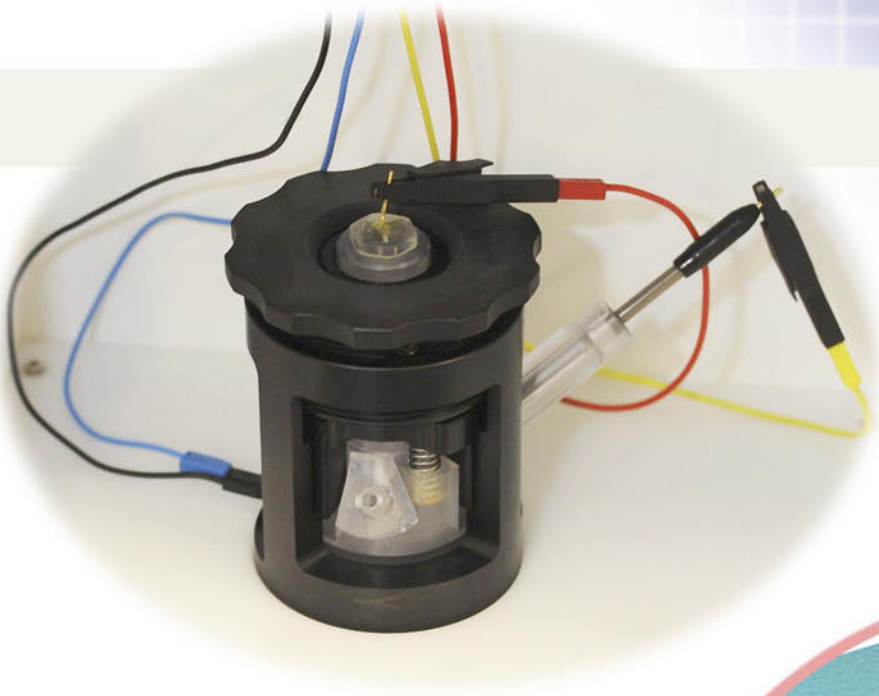
High Resolution Impedance Technology

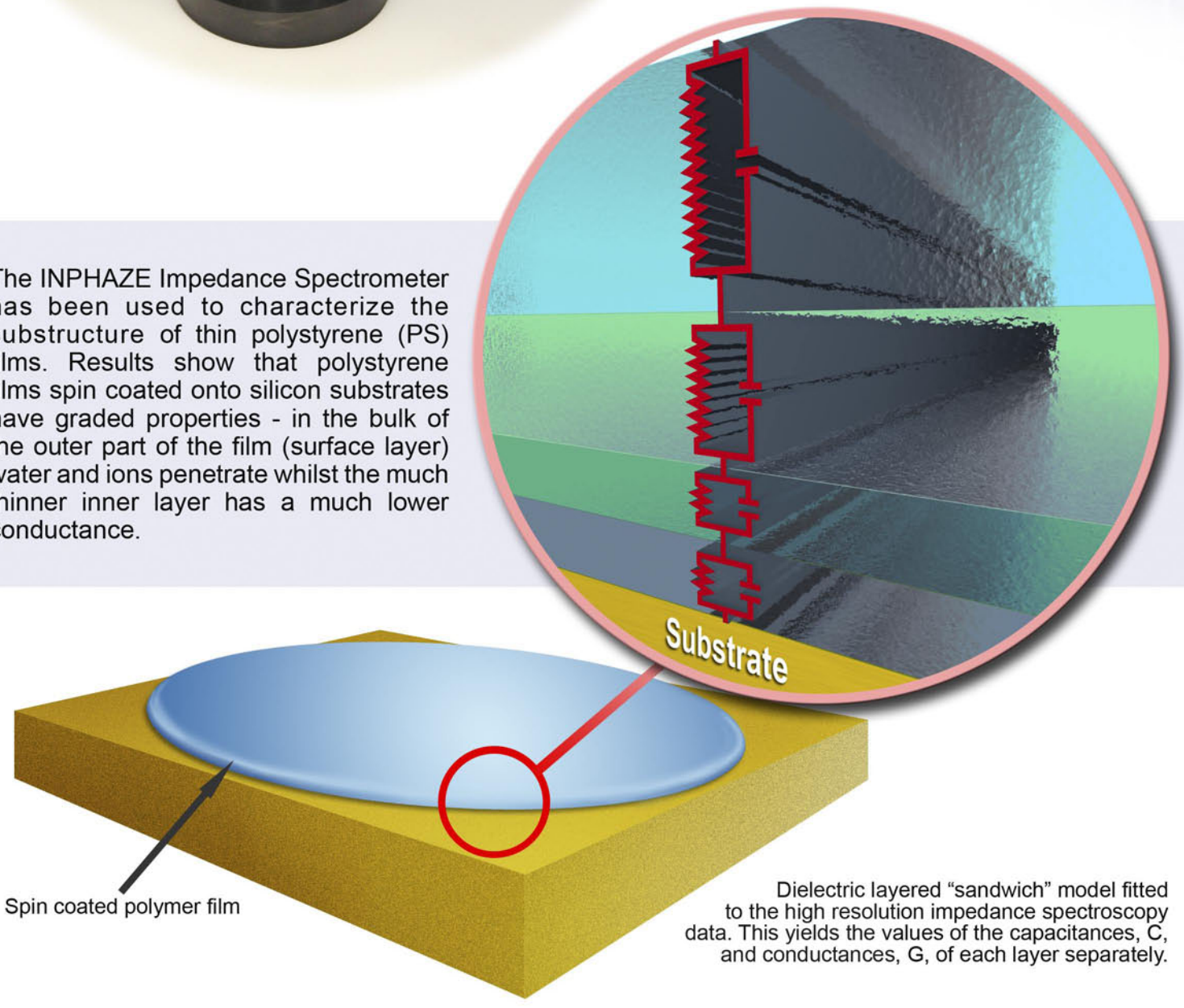


Polymers

The INPHAZE Impedance Spectrometer is able to measure the phase angle at each frequency with unprecedented precision. This enables it to characterise the substructure of thin films of:

- Conducting polymers
- Plasma modifications of polymers
- Biopolymers
- Proteins

The INPHAZE Impedance Spectrometer has been used to characterize the substructure of thin polystyrene (PS) films. Results show that polystyrene films spin coated onto silicon substrates have graded properties - in the bulk of the outer part of the film (surface layer) water and ions penetrate whilst the much thinner inner layer has a much lower conductance.



Dielectric layered "sandwich" model fitted to the high resolution impedance spectroscopy data. This yields the values of the capacitances, C, and conductances, G, of each layer separately.

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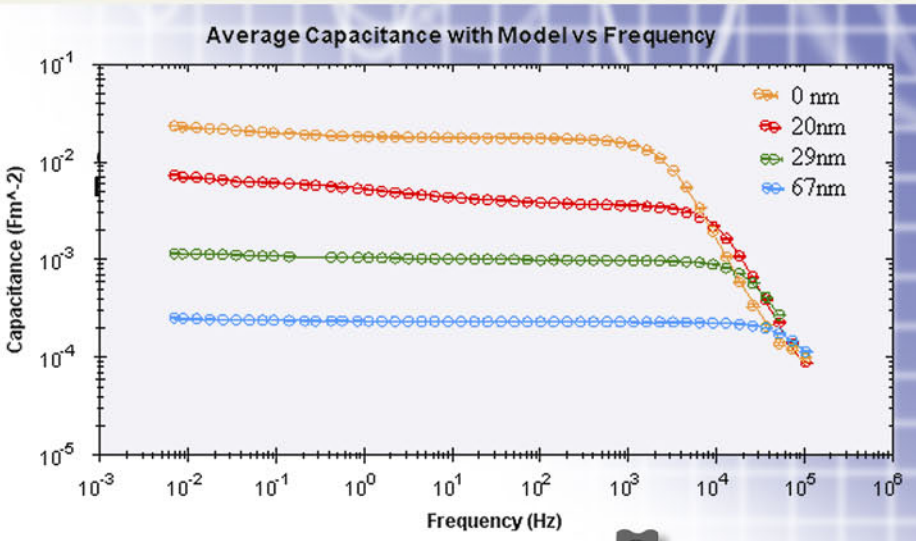
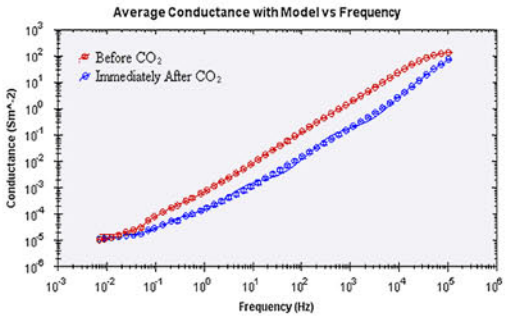
Capacitance vs. Frequency for four different polystyrene film thicknesses

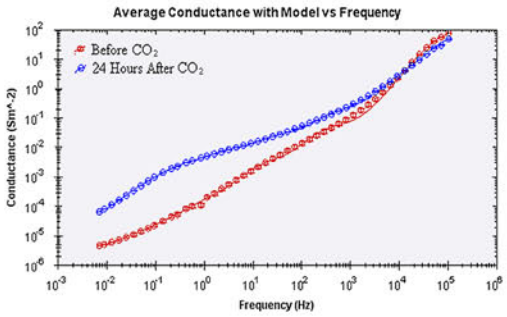
The Inphaze Spectrometer has been used to measure the effect of CO_2 on the PS thin film. (Contact with CO_2 is a technique used to plasticize only the surface layer of a polymer). The results show the initial swelling effect that CO_2 had on the density profile of PS illustrated by the large decrease in the capacitance and how the polymer relaxed as the CO_2 diffused out.

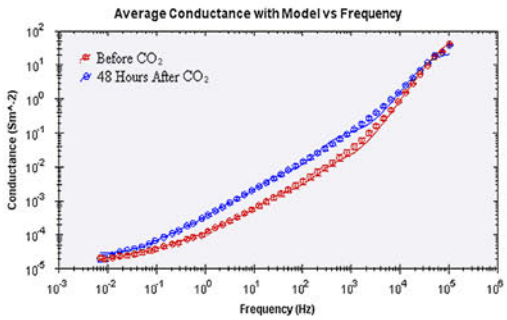
The results also show that the thickness of the PS film was thinner 48 hours after exposure to CO_2; illustrated by an increased capacitance at all frequencies.

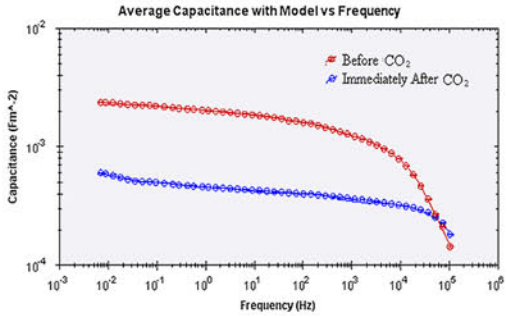


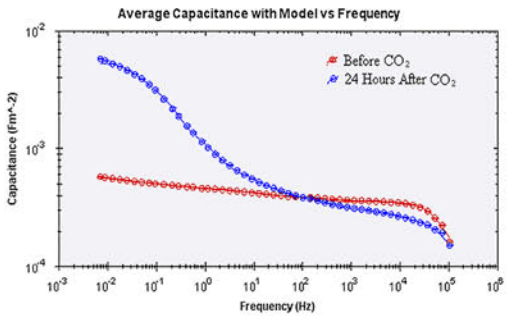
Capacitance and Conductance data for before, and 24 and 48 hours after CO_2 exposure

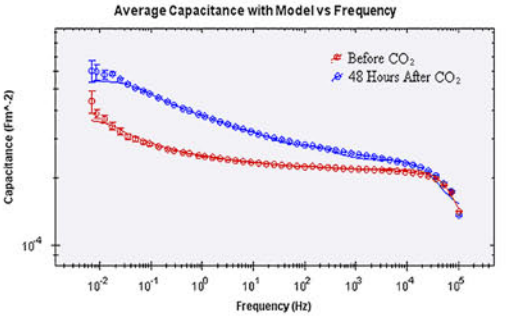












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