Dielectric Spectroscopy of thin polymeric films

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Dielectric spectroscopy is a non-destructive technique that measures the frequency response for a sample of dielectric material. Standard approaches to dielectric spectroscopy use bulk samples placed in a 50Ω matched capacitance holder. The frequency response recorded is attributed to the dielectric properties of the sample [Kremer03].

In this project, the material of interest is a thin (100-200 nm) polymer film. These films are found in a range of applications including the hydrogen fuel cells [Paddison01]. The goal is to develop a measurement technique that can extract the dielectric spectral response of a thin film sample. As these samples are not self-supporting, the film must be fabricated on top of the measurement electrodes.

In order to measure the dielectric spectral response of thin film polymeric sample, the polymer will be spin-coated onto electrodes embedded in a silicon wafer. The capacitance response of this structure will be measured using an impedance analyzer (HP 4294A). Parallel electrode designs and an interdigitated electrode structure have been studied.

Analytical and finite element calculations have been used to determine the most suitable electrode dimension for these measurements. These designs and the proposed fabrication process will be discussed.

REFERENCES
