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## **Determining Confounding Sensitivities in Eddy Current Thin Film Measurements**

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Eddy-current (EC) techniques are widely used in industry to measure the thickness of non-conductive films on a metal substrate. This is done using a system whereby a coil carrying a high-frequency alternating current is used to create an alternating magnetic field at the surface of the instrument's probe. When the probe is brought near a conductive surface, the alternating magnetic field will induce ECs in the conductor. The substrate characteristics and the distance of the probe from the substrate (the coating thickness) affect the magnitude of the ECs. The induced currents load the probe coil affecting the terminal impedance of the coil. The measured probe impedance is related to the lift off between coil and conductor as well as conductivity of the test sample. For a known conductivity sample, the probe impedance can be converted into an equivalent film thickness value. The EC measurement can be confounded by a number of measurement parameters. It is the goal of this research to determine which physical properties of the measurement set-up and sample can adversely affect the thickness measurement.

The eddy-current testing is performed using a commercially available, hand-held eddy-current probe (ETA3.3H spring-loaded eddy probe running at 8 MHz) that comes with a stand to hold the probe. The stand holds the probe and adjusts the probe on the z-axis to help position the probe in the correct area as well as make precise measurements. The signal from the probe is sent to a hand-held readout, where the results are recorded directly in terms of liftoff or film thickness. Understanding the effect of certain factors on the measurements of film thickness, will help to evaluate how accurate the ETA3.3H spring-loaded eddy probe is at measuring film thickness under varying experimental conditions. This research will study the effects of a number of factors such as i) calibration, ii) conductivity, iii) edge effect, iv) surface finish of base material and v) cable condition and compare with the long term reproducibility of a standard measurement.

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