

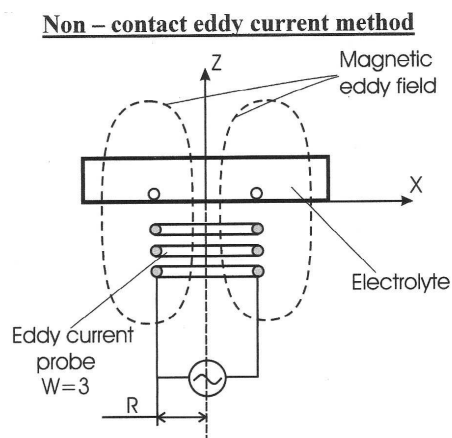
NON-DESTRUCTIVE TESTING OF MATERIALS AND DEVICES FOR ENERGY CONVERSION AND STORAGE

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At the development of the new devices for power conversion and storage the following physical non-destructive quality control methods have been developed by Ener1:

1. Non-contact eddy-current method.
2. Non-contact capacitance method.
3. Ultrasonic shadow pulse.
4. Acoustic impedance methods.

1. **Electromagnetic method (eddy-current method)** is based on the registration of eddy currents induced by changing electromagnetic fields in an excitation coil.



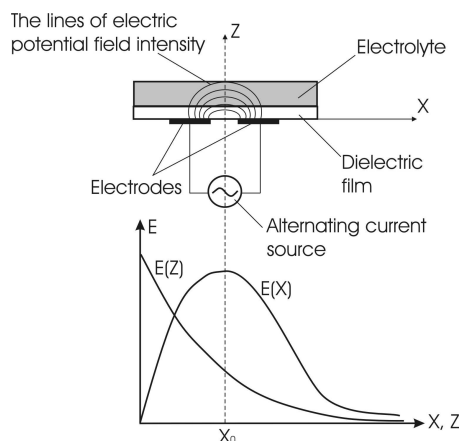
The eddy current apparatus and procedures are used for study of solid inorganic and polymer electrolytes being developed by Ener1 for lithium-metal secondary power sources. The eddy current system can measure solid electrolyte specific conductivity, thickness and homogeneity of cathode mass, etc.

Ener1 has developed eddy-current non-contact method for testing conductivity of powdered materials which are used for electrode coating.

In the presentation we will show the prospects of the eddy-current method to ensure the high quality of the product at battery manufacturing.

2. **Non-contact capacitance method** is acceptable for the measurement of conductivity without influence of the resistance between current collector and material contact, for mixing uniformity multi-component mixtures and other parameters of the semifinished items of materials applied in chemical power sources.

For a given material, one can determine the relative purity using this method. Factors representing the value of solid electrolyte specific conductivity (σ) and variations in thickness can be used for the determination of the frequency range for understanding conductivity mechanism in solid electrolytes.



3. **Ultrasonic shadow pulse method** is used for the determination of lamination quality in the multi-layer components of batteries, super capacitor, solar cell, etc. Attenuation of the ultrasonic signal at the boundary of a delamination normal to the surface of the cell under test is an indication of a flaw.

4. **Acoustic impedance method:** a change in the impedance of the product being tested indicates defects inside of the electrode structure and lack of stratification between components of power source.

Non-destructive quality control methods are well suited for use on the production lines at assembling energy conversion and storage devices. The methods presented here is not a whole list of the non-destructive control methods that are being developed by Ener1 and can be used at battery manufacturing.