Air coupled ultrasonic testing of batteries

Can air-coupled ultrasound detect a lithium battery during charging?
Based on Biot's theory of fluid-saturated porous media, this paper uses air-coupled ultrasound to detect the ultrasonic propagation behavior of a lithium battery during charging, as well as the electrical quantity, obtaining fast-wave and slow-wave time-domain signals.

Can air-coupled ultrasonic testing detect pre-embedded stomata defects in lithium-ion batteries?
The C-scan result verified that air-coupled ultrasonic testing technology can accuratelyand effectively detect the pre-embedded stomata defect and natural stomata defect in a lithium-ion battery,which is able to promote and expand the application of the technology in the field of electric energy security. 1. Introduction

How does air-coupled ultrasonic testing work?
Under air-coupled conditions, an ultrasonic wave is excited, propagated and received through a variety of media and fluid-solid coupling interfaces, particularly in air-coupled ultrasonic testing of a lithium-ion battery.

Can ultrasonic inspection detect lithium ion batteries?
The ultrasonic inspection technique can also detect defection for Li-ion batteries. Li and Zhou utilized air-coupled ultrasonic wave for stomata defect detection,and Robinson et al. identified the designed missing half of the negative-electrode layer with the ultrasonic signal amplitude.

What is ultrasonic testing?
Ultrasonic testing is one of the most widely used techniques for nondestructive evaluation of material properties and structural health monitoring. The stress wave excited by the ultrasonic transmitter propagates in the material and is received by the ultrasonic receiver.

How is ultrasonic propagation in a battery monitored?
Analysis is conducted on the propagation characteristics of ultrasound in the battery using Biot's fluid-saturated porous media model; the signal is monitored in real time by monitoring ultrasonic waves during charging,and fast-wave and slow-wave signals are obtained.

has developed systems for non-destructive reliable and reproducible inspections of battery pouches. Our imaging ultrasonic inspection technique can be used in the laboratory, ...

Here, we present a contactless ultrasound spectroscopy technique based on the use of air-coupled transducers of high sensitivity and wide frequency band to detect state-of-charge (SOC)-related changes in LIB cells in operando. Additionally, its ability to detect mechanical integrity alterations was also revealed, showing the potential of ...

At IEEE-IUS 2023, Montreal we presented our results obtained testing Li-ion pouch cells using wideband,

air-coupled ultrasound and spectral analysis in the frequency range 0.1-1.5 MHz. Results show that i) it is possible to generate and sense thickness resonances, ii) these resonances are sensitive to the state of charge and ...

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monolayer microporous membrane separators for lithium-ion batteries by using an ultrasonic non-destructive test that can be compatible with the manufacturing process. Therefore, an air ...

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With the advent of lithium-ion batteries (LIBs) and electric vehicle (EV) technology, the research on the battery State-of-Charge (SoC) estimation has begun to rise and develop rapidly.

Air-coupled ultrasonic testing of carbon/carbon composite aircraft brake disks. Mater. Eval., 71 (2013), pp. 987-994. View in Scopus Google Scholar. Sanabria et al., 2015. S.J. Sanabria, R. Furrer, J. Neuenschwander, P. Niemz, P. Schütz. Analytical modeling, finite-difference simulation and experimental validation of air-coupled ultrasound beam refraction ...

This work describes the use of an air-coupled and through transmission ultrasonic (0.2-1.5 MHz) technique, both at normal and oblique incidence, for the characterization and test of pouch-cell Li-ion (and similar types) batteries and components. Time domain measurements show that it is possible to measure ultrasonic velocity in the battery ...

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This paper studies and demonstrates the application of air-coupled ultrasonic testing technology to nondestructive testing of the stomata defect in a lithium-ion battery. Firstly, based on the characteristics of the

periodic stacking structure of a lithium-ion battery core and the corresponding relationship between the air-coupled ...

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Different ultrasonic testing setups are explored to determine the optimal testing parameters for the battery. An ultrasonic monitoring system is developed to monitor the battery during charge/discharge at 750 kHz, 1 MHz, and 1.5 MHz. Signal processing algorithms are proposed for extracting three ultrasonic features--amplitude, wave velocity ...

These preliminary results indicate that the proposed air-coupled ultrasonic NDT method with leaky Lamb waves can be used to inspect the sealing integrity of Li-ion pouch batteries in dry test ...

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