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Contact Stiffness Based Characterization of Stress Distribution within a Tensioned Web

Acoustic/laser method for inline web stress correction in roll-to-roll electronics manufacturing.

Researchers at Purdue University have developed a method and apparatus for mediated stress distribution via a tension web. This approach uses acoustic and laser pulses to accurately sense and correct web stress. The technique features non-contact resonance and gentle contact stiffness mapping to measure web tension and linear variation. This can be implemented in roll-to-roll manufacturing (R2R) for inline process monitoring to alleviate stress brought on by device stiffness, resonance, and/or indentations. Currently, stress is not well replicated between products in R2R processes. Purdue researchers aim to improve product quality for electronic devices including thin film transistors, supercapacitors, organic light emitting diodes (OLEDs), solar cells, antennas, and sensors by eliminating friction and misalignment in R2R.

Technology Validation: In testing, 35.58% cross-span tension variation (representing both average tension as and linear variation) was measured across the system, recording only 3.43-4.12% of discrepancy.

Advantages:

- Mediated distribution of stress for roll-to-roll manufacturing (R2R)

- Product quality improvement for R2R devices

Applications:

- Manufacturing of thin films and electronics

- Mapping of stresses across a tensioned web

TRL: 5

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Category
Buildings, Infrastructure, & Construction/Infrastructure
Modeling & Digital Twins
Digital Health & Medtech/AI in Medical Imaging
Materials Science & Nanotechnology/Materials Testing & Characterization Tools

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Intellectual Property:

Provisional-Patent, 2021-04-05, United States

NATL-Patent, 2022-04-05, Republic of Korea

PCT-Patent, 2022-04-05, WO

NATL-Patent, 2022-04-05, Europe

NATL-Patent, 2022-12-19, United States

NATL-Patent, 2023-10-02, Japan

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