

My Web of Science

Profile

My researcher profile

EDIT

My records

Publications

ADD

Peer reviews

ADD

Editor records

ADD

Editorial board memberships

ADD

Pending records

Profile notifications

[Search](#) > Author Profile

Electromechanical Impedance Simulation-Based Evaluation of Cracks in Photovoltaic Solar Cells

By: Beroual, S (Beroual, Sabir) ; Hrairi, M (Hrairi, Meftah)

[View Web of Science ResearcherID and ORCID](#) (provided by Clarivate)

ARABIAN JOURNAL FOR SCIENCE AND ENGINEERING

DOI: 10.1007/s13369-023-07733-9

Early Access: MAR 2023

Indexed: 2023-03-31

Document Type: Article; Early Access

Abstract:

Structural Health Monitoring (SHM) based on electromechanical impedance (EMI) has been widely used in different engineering domains for the detection of structural damages, especially for detecting cracks that happen due to multiple reasons such as various natural conditions and operating cycles. However, studies of SHM based on EMI technique for the detection of faults in photovoltaic (PV) solar cells are very limited. This study aims to develop and integrate the EMI technique as a permanent monitoring system, to detect structural faults in advance, to maintain the PV system's effectiveness and to ensure safety from catastrophic accidents. This work presents a numerical analysis of different models, such as free piezoelectric PZT patches of various shapes and several scenarios for healthy and cracked solar cells in order to investigate the capabilities of this technique. The crack is highlighted as a common damage in PV solar cells, and two of its characteristics were investigated namely, the crack location and the crack depth, where both are simulated with a pseudo-square monocrystalline solar cell. In addition, the root mean square deviation damage index is used to assess the severity of the damage. The results indicate that the

damage index frequently changes with the variation in location and depth of the crack. Indeed, the proposed EMI technique can efficiently estimate the damage and its severity, which makes it possible to integrate it as a permanent detection and monitoring technique in a PV system.

Keywords

Author Keywords: Electromechanical impedance; Piezoelectric patch; Solar cell; Crack location; Crack depth; Finite element analysis

Keywords Plus: DAMAGE; REPAIR

Addresses:

¹
▼ Int Islamic Univ Malaysia, Fac Engr, Dept Mech & Aerosp Engr, POB 10, Kuala Lumpur 50728, Malaysia

Categories/ Classification

Research Areas: Science & Technology - Other Topics

Citation : 7 Engineering & Materials > 7.226 Electrical - Sensors & > 7.226.441 Lamb
Topics Science Monitoring Waves

Web of Science Categories: Multidisciplinary Sciences

Document Information

Language: English

Accession Number: WOS:000949755700003

ISSN: 2193-567X

eISSN: 2191-4281

Other Information

IDS Number: 9X4QD

– [See fewer data fields](#)

Citation Network

In Web of Science Core
Collection

0

Citations

37

Cited References

Use in Web of Science

Web of Science Usage Count

4

4

Last 180 Days Since 2013

This record is from:

Web of Science Core Collection

- Science Citation Index Expanded (SCI-EXPANDED)

Suggest a correction

If you would like to improve the quality of the data in this record,

© 2022 Clarivate
Training Portal
Product Support

Data Correction
Privacy Statement
Newsletter

Copyright Notice
Cookie Policy
Terms of Use

Cookie Settings

Follow Us

