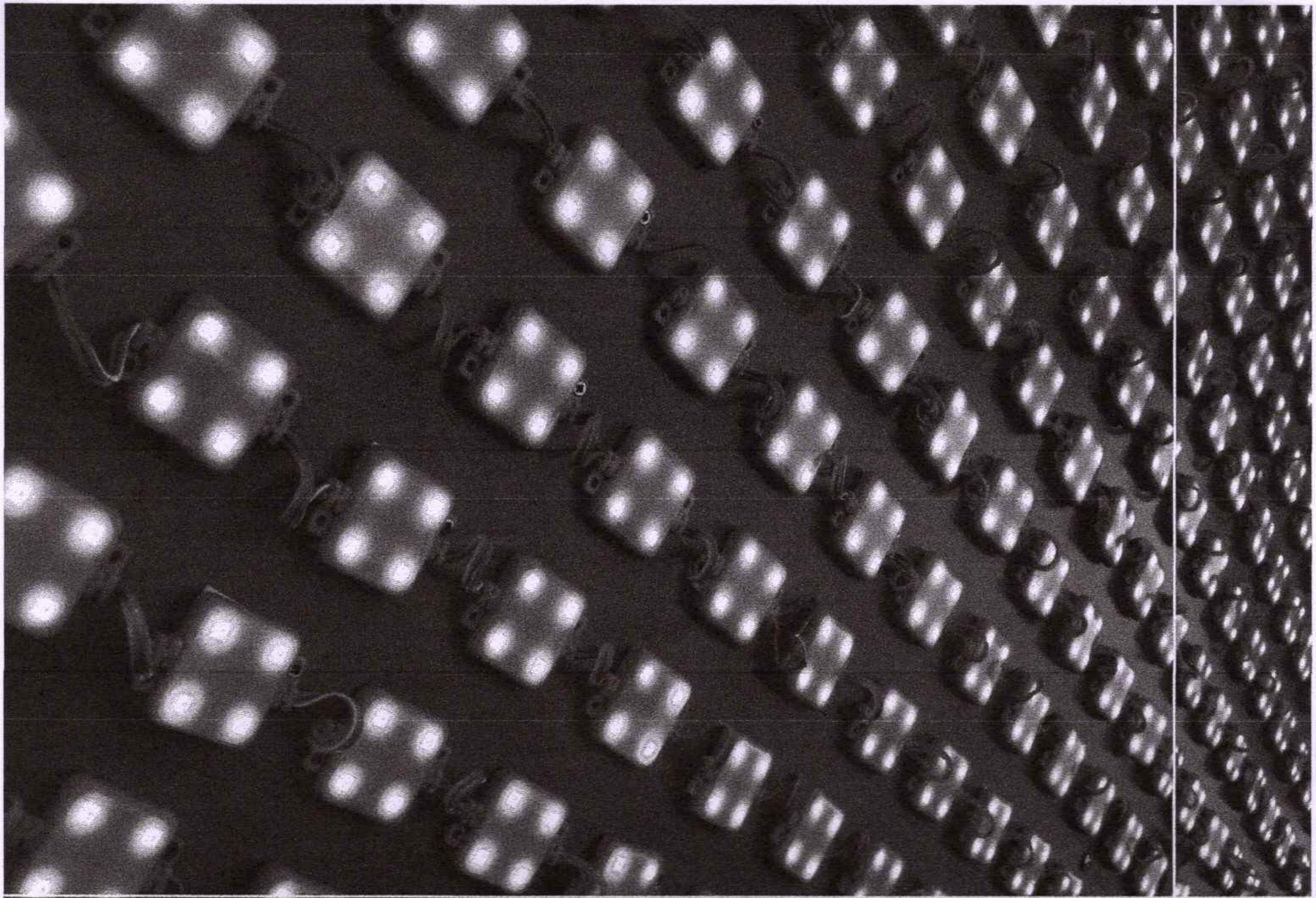

ORGANIC AND INORGANIC LIGHT EMITTING DIODES

Reliability Issues and Performance Enhancement

Edited by
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and Wladek Grabinski

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Organic and Inorganic Light Emitting Diodes

This book covers a comprehensive range of topics on the physical mechanisms of LEDs (light emitting diodes), scattering effects, challenges in fabrication and efficient enhancement techniques in organic and inorganic LEDs. It deals with various reliability issues in organic/inorganic LEDs like trapping and scattering effects, packaging failures, efficiency droops, irradiation effects, thermal degradation mechanisms, and thermal degradation processes.

Features:

- Provides insights into the improvement of performance and reliability of LEDs.
- Highlights the optical power improvement mechanisms in LEDs.
- Covers the challenges in fabrication and packaging of LEDs.
- Discusses pertinent failures and degradation mechanisms.
- Includes droop minimization techniques.

This book is aimed at researchers and graduate students in LEDs, illumination engineering, optoelectronics, and polymer/organic materials.

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Application of electric springs in fuel cells

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ABSTRACT

As an energy source, fuel cells are a good option for distributed generation and implementations for hybrid vehicles. One of the key problems of this technology are its slow internal electrochemical and thermodynamic response, which lead to slow reaction time to transient electrical loads. This article proposes a new configuration and a novel control strategy to solve fuel cell weak transient response by using type 1 AC electric spring (ES-1). Furthermore, it will be shown that the same configuration helps in decreasing the required space for battery storage.

1. Introduction

Electric spring is a new emerging technology mainly intended for demand side management applications by controlling the current and voltage of the non-critical loads to follow generated power profile, especially by renewable energy resources. Since then it has been used in various applications such as power quality enhancement and optimization of micro-grid operation. Different types of electric spring have been proposed for both AC and DC grids. In order to form a smart-load electric spring should be connected in series with a noncritical load such as a water heater. This paper proposes a new application for the AC electric spring type 1 connected in series with the noncritical load as a smart load to mitigate the load transients which can affect the lifespan and the hydrogen consumption of the Fuel Cell. It will be shown that this solution helps not only to improve the efficiency of the Fuel Cell operation and provide an AC voltage regulation but also eliminate the use of the battery storage system compared to the conventional topology where the battery is in parallel with the Fuel Cell. The idea of electric spring is derived from the mechanical spring system. A mechanical spring can store energy when stretched and can release the stored energy when required. Similarly, electric spring works to improve the power quality. When the voltage dips down below certain pre-fixed reference level then it adds up to the voltage of the system to make it equal to the preset reference value. In the same way if voltage is increased then it can create a negative voltage to make voltage profile equal to reference value.

2. System modelling

In this section, a brief explanation of the modelling of the fuel cell is given (Figs. 1-9). The proposed system is composed of a PEM-FC connected to a DC/DC boost converter and a DC/AC single-phase inverter is also used with an LC filter to supply AC voltage to the loads. Besides, the electric spring is connected in series with the non-critical load to form a smart load (SL).

2.1. Modeling of PEM-FC

One of the most developed fuel cells is Proton Exchange Membrane fuel cell (PEMFC). PEMFC has been proven as a reliable energy source in transportation as well as power generation [6]. The model used in this study is based on the dynamics of PEMFC developed and validated in [6]. The model is based on the equivalent electrical circuit to represent the electrochemical and thermodynamic behaviour of the PEMFC.

The cell voltage is described as follows:

$$Vcell = Ecell - Vact - Vohm - Vconc$$

E_{cell} is the cell open circuit voltage
V_{act} is the activation voltage
V_{ohm} is the ohmic voltage drop
V_{conc} is the concentration voltage drop

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Improved DC Performance Analysis of a Novel Asymmetric Extended Source Tunnel FET for Fast Switching Application

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