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Author: Dr. Guler Kocak
SPACELIS Space Technologies, Türkiye

Mr. Ismail Topcam
SPACELIS Space Technologies, Türkiye

NEXT GENERATION ULTRA-LIGHT WEIGHT FLEXIBLE SPACE SOLAR CELL DESIGN

Abstract

This study explores the forefront of clean energy technology with a focus on the development of next-generation ultra-lightweight flexible space solar cells. Traditionally, electronic devices have been constructed using rigid materials like silicon and glass. However, the advent of printing electronics technology has ushered in a new era, enabling the fabrication of thinner, lighter electronic devices that can bend and fold without damage.

Printed organic solar cells stand out as a significant trailblazer in this domain, offering unparalleled flexibility, recyclability, and cost-effectiveness. This technology has the potential to revolutionise the energy landscape, particularly in remote areas and harsh environments. The lightweight and rollable design of these solar cells presents a disruptive future energy technology, reducing pollution caused by space debris and addressing the challenges posed by the 2020 pandemic.

In response to the global challenge of energy demand, this paper proposes a technical solution based on organic photovoltaic solar cells. These cells, characterised by thin-film layers and ultra-lightweight design, are particularly suitable for integration into space systems, including small satellites and Moon to Mars missions. The study outlines a comprehensive technical plan, encompassing the development of plastic substrates, characterisation of thin active layers, deposition of thin metal layers, and encapsulation to ensure durability. The proposed cell design charts a course from laboratory verification to real-world application and space tests, with a focus on achieving highly efficient solar cells.

The research emphasises the global relevance of the challenge, necessitating innovative solutions and international collaboration. The flexibility and lightweight nature of the proposed solar cells make them not only suitable for space applications but also for building integrated photovoltaic technologies in various sectors, including defence and renewable energy industries. The study delves into the technical intricacies, success criteria, and the journey towards making flexible organic solar cells a cornerstone of future energy solutions.

In conclusion, the Next Generation Ultra-Lightweight Flexible Space Solar Cell Design presented in this paper represents a paradigm shift in clean energy technology. By addressing global energy challenges and focusing on the technology's potential impact, the paper contributes to the discourse on sustainable energy solutions for both terrestrial and space applications.