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SPACECRAFT SURFACE SENSING FOR IMPACT DETECTION

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Keywords: spacecraft surface sensing, fiber bragg grating, impact detection, acoustic emission

This study reviews problem of spacecraft impact with micrometeoroids and dust particles and its consequences. Those impact could lead to spacecraft hull degradation, holes, subsystems malfunction. Impact with massive particle could cause the spacecraft to go off course and inflict collateral damage to it, which could lead to its total destruction.

The purpose of this study is to review existing methods of impact detection and to propose a system based on one of those methods which could be a potential solution to this problem.

Nowadays there are 8 methods of impact detection applicable to the spacecraft. Two of those methods were inspected closely - acoustic emission method and fiber optic usage. After careful studying of those methods the decision was made to create a hybrid system, which consists of fiber optic sensors based on bragg gratings, but the detection principle itself based on acoustic emission phenomena. This system consists of several fiber bragg grating sensors, half of which is supposed to be mounted on the inner side of the spacecraft hull and supposed to detect acoustic emission waves, and the other half serves as reference ones. Moreover, system includes temperature stabilization for the gratings in order to maintain a constant temperature for the gratings.

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THE PROBLEM OF HEAT LOSS IN SOLAR PANELS

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Key words: hyperbolic thermal emitter, renewable energy, photovoltaic cell, p-n junction

The article gives an overview of such a promising device as a hyperbolic thermal emitter (HTE). This device consists of highly aligned carbon nanotubes. Due to the properties of nanotubes, the emitter can

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absorb heat and convert it into light, which can be used by solar panels to produce electricity.

Currently, the device is not ready to enter the market, as it is still being tested in laboratories, but in the future HTE may change the solar energy market.

The purpose of this work is to provide with information about the principle of solar cells operation, the causes of heat loss, and suggest a possible solution to the problem.

The article considers the HTE device and its main properties as well as methods of using the HTE with solar panels. Some information on photovoltaic cells as the basis for solar panels is also presented. It is spoken about the properties of silicon – the most common material for solar panels manufacturing. It is mentioned about the main types of solar panels used nowadays.

The experiments show that the use of HTE together with modern solar panels can increase their efficiency up to 80% compared to 47% for the most high-tech panels, thereby confirming the status of HTE as one of the promising areas for further study.

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НАПРАВЛЕНИЯ ПОВЫШЕНИЯ БЮДЖЕТНОЙ ОБЕСПЕЧЕННОСТИ РЕГИОНОВ

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Ключевые слова: бюджет, бюджетная система, бюджетная обеспеченность, межбюджетные трансферты, бюджетное выравнивание

Целью исследования было, предложить направления повышения бюджетной обеспеченности регионов, которые позволили бы оптимизировать межбюджетные потоки с учетом налогового потенциала субъектов РФ.

Автором, для совершенствования модели повышения бюджетной обеспеченности регионов предложено в качестве основного инструментария выравнивания бюджетной обеспеченности регионов замену части НДС на налог с оборота, оставляемый в регионах и участвующий в горизонтальном выравнивании.

Под бюджетной обеспеченностью в абсолютном выражении, автором понимается, отношение налоговых и неналоговых доходов бюджета к численности населения (тыс. руб. / человек в год).

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