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NANO MATERIALS, SPECIALISED TECHNOLOGIES AND EQUIPMENT FOR PRODUCTION FLEXIBLE HYBRID SYSTEM WITH HIGH ENERGY LI BATTERIES AND PV MODULES FOR SPACE APPLICATIONS.

Abstract

Nanostructured innovative new generation hybrid systems based on high energy, safety and low cost Li-ion batteries and PV modules are offering unprecedented performances for space applications. The problems of the bridging the gap between the achievements of the material science, materials limitations, manufacturing requirements, and requirements of space application equipment

Unprecedented performances of developed hybrid system is based on the synergetic effect of nanostructured materials for Li-ion battery and PV modules, and on the non-destructive non-contact methods and equipment for evaluation the initial materials, semi- and final product during Li batteries and PV modules production. Some examples include as follow.

For high energy Li-ion battery nanostructured Si - graphite composite electrode are produced using the innovative method of gas detonation deposition. This electrode does not require a polymer binder, has high level of adhesion between current collector and the composition of Si - graphite; and high level cohesion the particle of Si and graphite. These unique properties provide improved stability of the structure of electrodes and stability of the energy parameters of the Li-ion battery during cycling

Breakthrough flexible PV module encapsulated with the patent pending nanostructured transparent polymer that is flexible, durable, has high level of adhesion for various materials, provides high level of hermetic sealing (waterproof) and UV protection, and contains nanostructured clusters with sizes from 20 to 100 nanometers, and micro-domains from 15 to 120 microns. Such composition of nanostructured clusters and micro-domains, located in a certain order in the volume of the polymer, results in micro lensing which increases the concentration of light reaching the semiconductor layer. This dramatically improves the performance of encapsulated PV modules as compared with PV modules laminated with glass or encapsulated with multilayer structure of other polymers, and results in increase efficiency, reduce the weight and manufacturing cost of PV modules.

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