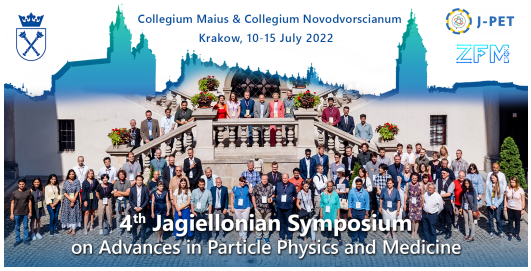

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3D printed lightweight and modular lithium-ion Uninterruptible Power Booster for medical devices

Thursday, 14 July 2022 16:10 (15 minutes)

Advanced devices for diagnostics and medical therapy require a constant and stable power source. The disadvantage of commonly used uninterruptible power supply (UPS) is the heavy weight[1], centralization and the need to use specially prepared rooms and dedicated electrical installations. The aim of the presented research is to prepare a safe, economic and modular Uninterruptible Power Booster (UPB). A UPB can increase the insufficient power output of the mains supply, guaranteeing power for the pre-planned time. Low price and modularity are possible due to the use of 3D printing and Li-ion cells, which will allow the construction of UPB installed in the immediate vicinity of the protected device. Among available technologies of chemical energy storage, Li-ion cells are characterized by high gravimetric and volumetric energy density[1]. Currently, liquid electrolytes(LE) are used in Li-ion cells, which have good ionic conductivity, but are flammable, toxic and sensitive to lithium dendrite overgrowth, which may lead to an internal short circuit and damage to a given module. For safety reasons, a much better solution than LE would be solid electrolytes(SE), which would not be flammable and hazardous to the environment. Due to the fact that SE constitute a barrier to lithium dendrites, they can extend the working time of li-ion cells[2]. Currently, there is no known material that would fit well as a SE for li-ion cells. There are several materials under development, but they are not ready for industrial applications[3,4].This presentation concerns the research conducted on SE, synthesized with the use of cheap, environmentally safe materials. For this purpose, syntheses of materials based on silicon glass and polysaccharides were performed. Methods of syntheses and the results for measuring the ionic conductivity of the tested electrolytes and an example UPB for J-PET mobile tomograph will be presented[5,6]. The use of this solution with stationary devices will allow to reduce electricity costs by loading the energy storage using a less expensive night tariff, and then using the collected energy during the day, and also to install the device in a room without access to a UPS system.
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