Paper ID: 78569
interactive
student

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Specialized Technologies, Including Nanotechnology (8)

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ORGANIC-INORGANIC HYBRID (OIH) COMPOUNDS FOR SMALL SPACECRAFT MISSIONS

Abstract

Over the past few decades, the development and improvement of organic-inorganic hybrid (OIH) compounds have attracted considerable interest due to their wide range of possibilities and various applications. Due to the mixture of organic and inorganic precursors, OIH materials have unique and superior properties compared to conventional ones. In addition, under moderate synthesis conditions, OIH can be easily produced by the sol-gel method. Mixing organic polymers with inorganic materials in a single phase allows a remarkable tailoring of different properties, such as optical, electrical and mechanical. Under external conditions like temperature, pressure, or an electric field, these materials display switchable properties. They can be successfully used as electrical signal switches, sensors, capacitors or non-volatile memories. The tremendous growth and success of OIH materials are inextricably linked to the synthesis process, the wide range of chemical precursors available and the potential applications as functional materials. One of the more interesting materials that are also currently gaining notoriety, due to its photovoltaic properties, is perovskites. Hybrid organic-inorganic perovskites (HOIPs) are materials that may be processed using solutions, contain elements that are abundant on Earth, and nevertheless display exceptional semiconducting and light-absorption qualities . Due to these characteristics, HOIPs are promising for optoelectronic applications in general and photovoltaic (PV) devices. After 12 years of PV research, power-conversion efficiencies have exceeded 24 %. The widely known electrical structure of HOIPs mirrors that of a good inorganic semiconductor, with optical gaps that can be almost optimal for solar absorption, minuscule exciton binding energies, and low effective masses. Effective charge-carrier generation, transportation, and collection are made possible by this combination. The application of organic-inorganic compounds in the space industry is a next step towards creating components that work with temperature fluctuations and whose properties and composition can be strictly controlled depending on the spacecraft mission.