

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Smart Materials and Adaptive Structures (5)

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ROV-E ACTIVITIES AT SOUTHAMPTON UNIVERSITY

Abstract

The ROV-E project is a three year Framework 7 project dedicated to the exploration of multifunctional technologies for use on Mars rovers. As part of this the University of Southampton has been looking at the development of a Multifunctional Power Structures. This is a structure that combines aspects of the electrical power system into a single component, removing the parasitic structures needed to support distributed discrete components in the Mars rover bus.

Looking to exploit the costs benefits of using off the shelf components, commercially available lithium polymer cells have been exposed to structural, temperature and pressure environments and have proved to be robust throughout the lifecycle of the panel. A concept optimisation has shown that design of the panel is a trade-off between not only capacity and strength, but also between mechanical loading of the cells and panel stiffness. A representative panel was manufactured, showing that it is possible to respect the limits of the selected cells and still create a valid component. This panel was then used experimentally to assess the failure methods of the cells, revealing that the cells are more likely to suffer performance loss due to bending than accelerations.

The work has then moved onto an assessment of the thermal control support required by multifunctional power structures in the mars environment. A study of current thermal control technology found that there exists no low mass solutions for maintaining cell temperature if the panel is part of a deployed structure. Even when the panel is part of the rover primary bus, only heaters were shown to be a mass efficient solution. The study did reveal that phase change materials could be an effective thermal control for intermittently used electronics. The final section of work completed was a study into the embedding of phase change materials into sandwich panel cores, which found the concept workable, provided the material is concentrated under the component.