Paper ID: 87005
oral

IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Microgravity Sciences on board of Space stations (6)

Author: Mr. Joachim Bonney
German Aerospace Center (DLR), Germany

Dr. Jan Gegner
German Aerospace Center (DLR), Germany
Mrs. Angelika Diefenbach
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany
Dr. Jean-Pierre Paul de Vera
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany

MATERIAL SCIENCE ONBOARD THE INTERNATIONAL SPACE STATION: PAYLOAD OPERATIONS AT THE MICROGRAVITY USER SUPPORT CENTER MUSC

Abstract

The Microgravity User Support Center MUSC at the German Aerospace Center (DLR) in Cologne operates two materials sciences payloads on behalf of ESA: The Electromagnetic Levitator (EML) for containerless processing, located in the COLUMBUS module, and the Materials Sciences Laboratory (MSL), a Bridgeman type furnace, in the NASA DESTINY module. Both, EML and MSL, have been successfully operated serving a broad international scientific community for 10 years and 15 years, respectively. During these operational spans a multitude of experiments in contactless or crucible/ampule contained environments, a variety of metals, alloys and semi-conductors have been successfully processed. During this time, operations of these facilities have been subject to permanent adaptations and improvements. On the one hand, the facilities are being upgraded e.g. with new diagnostics and capabilities. On the other hand, operations need to adapt to the changing ISS/ ground segment environment. Challenges for matured facilities are multiple and ranging from physical repairs and upgrades for new science requirements to operational mitigation of unavoidable anomalies by adapting operator training and experiment flows. With ESA's X-RAY FACILITY (XRF) for the COLUMBUS module, a new multi-purpose instrument is under development, enabling different in-situ and time-resolved X-ray diagnostics for various science research programs in space, focused on materials science, and also allowing life science, and radiobiology research. As the center responsible for the preparation and performance of the XRF experiments, MUSC is strongly taking benefit of the experience gained during operations of two major ESA material science payloads and developing new approaches for secure and successful operations. The paper will provide an overview of materials sciences operations at MUSC in the light of new opportunities in an evolving space utilization environment.