Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Studies of a new class of high electro-thermal performing Polyimide embedded with 3D scaffold in the harsh environment of outer space MANUELA LOEBLEIN, Nanyang Tech Univ, ASAF BOLKER, Soreq NRC, SIU HON TSANG, Temasek Laboratories@NTU, NURIT ATAR, Soreq NRC, CECILE UZAN-SAGUY, Technion - Israel Institute of Technology, RONEN VERKER, IRINA GOUZMAN, EITAN GROSSMAN, Soreq NRC, EDWIN HANG TONG TEO, Nanyang Tech Univ — The polymer class of Polyimides (PIs) has been widespread in the use of outer space coatings due to their chemical stability and flexibility. Nevertheless, their poor thermal conductivity and completely electrically insulating characteristics have caused severe limitations, such as thermal management challenges and spacecraft electrostatic charging, which forces the use of additional materials such as brittle ITO in order to completely resist the harsh environment of space. For this reason, we developed a new composite material via infiltration of PI with a 3D scaffold which improves PIs performance and resilience and enables the use of only a single flexible material to protect spacecraft. Here we present a study of this new material based on outer-space environment simulated on ground. It includes an exhaustive range of tests simulating space environments in accordance with European Cooperation for Space Standard (ECSS), which includes atomic oxygen (AO) etching, Gamma-ray exposure and outgassing properties over extended periods of time and under strenuous mechanical bending and thermal annealing cycles. Measurement methods for the harsh environment of space and the obtained results will be presented.

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Date submitted: 05 Nov 2015 Electronic form version 1.4