SELF-HEALING POLYMERS FOR INFLATABLE SPACE STRUCTURES

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Due to recent advances in space technologies extended human missions on the Moon and Mars are likely to take place soon, but the consequent prolonged exposure of crewmembers and devices to space will need new solutions to satisfy stricter requirements on spacecraft safety and autonomy. Self-healing materials are hence gaining interest as their integration into deployable space structures would make human activity in space safer and increase the operational life and autonomy of space structures. Nevertheless, the materials themselves could be deteriorated by space environment as well.

This study aims at designing and testing self-healing multilayers to be incorporated into inflatable structures, through evaluation of damage restoration performance of a set of self-healing polymers, used as nanocomposite matrices or inserted into a multilayer alongside an elastomer or an aramid fabric. Flow rate measurements to evaluate the self-healing response after puncture are followed by a preliminary analysis of the effect of simulated space gamma-ray irradiation on the self-repairing and functional properties of the materials.

Results show that the self-healing response is related to viscosity and decreases after irradiation. Better understanding of the synergic effect of space environment is hence needed to enable concept re-design at material and multilayer assembly level.