Contribution ID: **98** Type: **Oral Presentation**

Multifunctional composites with self-healing and radiation shielding properties for space applications

Friday, 17 September 2021 15:20 (20 minutes)

The interest towards self-healing materials for space applications has rapidly increased in the last twenty years, as space structures can acquire the ability to autonomously repair after damage thanks to these materials. Nevertheless, space radiation can lead to their degradation and seriously compromise their mechanical and functional performances, hence jeopardizing the spacecraft structural integrity and, in case of crewed missions, the astronauts' safety. A possible solution to this problem is represented by multifunctional materials that possess both self-healing and radiation shielding properties.

This research analyses two different types of radiation resistant self-healing materials. The first group is represented by multilayer composites (Figure 1), in which each layer has a specific function and differs from the others in terms of properties (e.g.: two separate materials may be used respectively for radiation protection and self-repair). The second family is less conventional and is formed by nanocomposites, in which nanofillers are added to a self-healing polymer to enhance its resistance to radiation. However, the addition of nanofillers decreases the healing efficiency in a manner yet not clear; it is hence necessary to find a compromise between radiation shielding and self-repair requirements.

Self-healing performance of multilayer composites and nanocomposites is assessed through puncture tests on previously manufactured samples, and a preliminary analysis of the effects of space radiation is performed. The ultimate purpose is to compare the two families of materials and, for what concerns nanocomposites, to find the optimal filler and the related amount to be added to the polymeric matrix so that radiation shielding properties are satisfactorily improved still maintaining an efficient self-healing behaviour.

Speaker Country

Italy

Primary author: Ms PERNIGONI, Laura (Politecnico di Milano)

Co-authors: Dr GRANDE, Antonio Mattia (Politecnico di Milano); Dr LAFONT, Ugo (ESA ESTEC)

Presenter: Ms PERNIGONI, Laura (Politecnico di Milano)

Session Classification: H3_Materials for space applications and extreme environments

Track Classification: H3. Materials for space applications and extreme environments (new - old H8)