

20th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)
Space Transportation Solutions for Deep Space Missions (4-D2.8)

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LARGE SIZE SPACE SHIP FRAME FOR DEEP SPACE MISSION CREATED ON EARTH ORBIT BY
DIRECT CURING OF COMPOSITE MATERIAL IN FREE SPACE ENVIRONMENT

Abstract

The size and mass of modern space constructions (space station, moon space ship) sent to the Earth orbit are limited by capacity of a launch vehicle. A multiple block technology with docking is used to achieve required size and volume. A new approach enabling large-size constructions in space relies on the use of the technology of a curing of fiber-filled composites impregnated with a liquid polymer matrix applied in free space. The technology has been demonstrated based on the experimental and theoretical investigations on the curing process in high vacuum, space plasma and temperature variations indicate that the curing process can be realized in Earth orbit. The curing process is sensitive to conditions of free space environment and to composition of polymer matrix. The selected compositions provide a bubble-free polymer matrix with crosslinking effect under the space irradiations. The results of laboratory experiments and stratospheric flight experiments are used for a new concept of multiplanetary space ship created on Earth orbit after one launch. The investigations were supported by Alexander von Humboldt Foundation, ESA, NASA and RFBR grants.