

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Smart Materials and Adaptive Structures (5)

Author: Dr. Se-Hyun Youn

Korea Aerospace Research Institute (KARI), Korea, Republic of, ysh@kari.re.kr

Mr. Ho-Kyeong Jeong

Korea Aerospace Research Institute (KARI), Korea, Republic of, hkjeong@kari.re.kr

Dr. Young-Soon Jang

Korea Aerospace Research Institute (KARI), Korea, Republic of, ysjang@kari.re.kr

Dr. Yeong-Moo Yi

Korea Aerospace Research Institute (KARI), Korea, Republic of, ymy@kari.re.kr

PYROSHOCK ATTENUATION USING 3-AXIS HYBRID MESH ISOLATORS WITH THE
APPLICATION OF PSEUDOELASTIC SMA WIRE

Abstract

In general, severe pyroshocks are imposed to the launch vehicle and satellite during the separation phases such as stage separation, fairing separation and satellite separation. These pyroshocks could generate malfunctions of electric components equipped in launch vehicle or satellite and could result in a catastrophic failure of launch operation. A new compressed mesh isolator called “3-axis hybrid mesh isolator” was introduced in this paper for the prevention of these malfunctions. 3-axis hybrid mesh isolator was manufactured by mixing pseudoelastic SMA wire and general metal wire for the improvement of the pyroshock isolation performance. Nonlinear hysteretic loading characteristic of general mesh structure effectively dissipates vibration and shock energy, moreover, pseudoelastic effect of SMA wire absorbs energy significantly due to the stress-induced phase transformation. Quasi-static loading tests were performed to confirm the isolation capability, and test results (load-displacement relationship) showed nonlinear hysteretic curve which assures the dominant absorption capability of the vibration and shock energy. Through pyroshock performance tests, it was shown that the 3-axis hybrid mesh isolator has the ability of remarkable shock attenuation due to the pseudoelastic effect of SMA wire with the hysteretic characteristic of mesh structure itself. From several verification tests, 3-axis hybrid mesh isolators showed outstanding isolation performance and these isolators were confirmed to be very effective for the isolation of severe pyroshock.