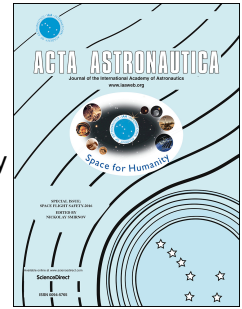


Accepted Manuscript

Erosion characteristics of ethylene propylene diene monomer composite insulation by high-temperature dense particles

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PII: S0094-5765(17)31842-8

DOI: [10.1016/j.actaastro.2018.01.055](https://doi.org/10.1016/j.actaastro.2018.01.055)

Reference: AA 6685

To appear in: *Acta Astronautica*

Received Date: 13 December 2017

Revised Date: 24 January 2018

Accepted Date: 30 January 2018

Please cite this article as: J. Li, M.-f. Guo, X. Lv, Y. Liu, K. Xi, Y.-w. Guan, Erosion characteristics of ethylene propylene diene monomer composite insulation by high-temperature dense particles, *Acta Astronautica* (2018), doi: 10.1016/j.actaastro.2018.01.055.

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1 Erosion Characteristics of Ethylene Propylene Diene Monomer

2 Composite Insulation by High-Temperature Dense Particles

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6 Abstract

7 In this study, a dense particles erosion test motor which can simulate the erosion state of a solid
8 rocket motor under high acceleration was developed. Subsequently, erosion experiments were
9 carried out for the ethylene propylene diene monomer composite insulation and the microstructure
10 of the char layer analysed. A turning point effect was found from the influence of the particle
11 impact velocity on the ablation rate, and three erosion modes were determined according to the
12 micro-morphology of the char layer. A reasonable explanation for the different structures of the
13 char layer in the three modes is presented based on the formation mechanism of the compact/loose
14 structure of the char layer.

15
16 **Keywords:** Solid Rocket Motor(SRM), Ethylene propylene diene monomer (EPDM); Insulation;
17 Ablation; Char structure; Thermal Protection System (TPS)

18 19 1.Introduction

20 Ethylene propylene diene monomer (EPDM) is a polymer prepared from ethylene, propylene,
21 and ethylidene norbornene or 1, 4-hexadiene or dicyclopentadiene monomers. EPDM composite is
22 a good internal insulation material for Solid Rocket Motors (SRMs) owing to various
23 advantageous features, such as low density, low ablation rate, and high thermal decomposition
24 temperature [1][2]. However, EPDM composite does not meet the requirements for some special
25 working conditions such as high flight acceleration or erosion by high-temperature dense particles.

26 With the widespread use of aluminised propellants, the high-temperature gas in SRMs

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