

Accepted Manuscript

Multi-layer polymer metal laminates for the fire protection of lightweight structures

S. Christke, A.G. Gibson, K. Grigoriou, A.P. Mouritz

PII: S0264-1275(16)30249-0
DOI: doi: [10.1016/j.matdes.2016.02.105](https://doi.org/10.1016/j.matdes.2016.02.105)
Reference: JMADE 1455

To appear in:

Received date: 4 December 2015
Revised date: 1 February 2016
Accepted date: 24 February 2016



Please cite this article as: S. Christke, A.G. Gibson, K. Grigoriou, A.P. Mouritz, Multi-layer polymer metal laminates for the fire protection of lightweight structures, (2016), doi: [10.1016/j.matdes.2016.02.105](https://doi.org/10.1016/j.matdes.2016.02.105)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

MULTI-LAYER POLYMER METAL LAMINATES FOR THE FIRE PROTECTION OF LIGHTWEIGHT STRUCTURES

S. Christke^{a,*} and A.G. Gibson^a

^a*Centre for Composite Materials Engineering, Newcastle University, Newcastle-upon-Tyne, Newcastle, NE1 7RU, England*

K. Grigoriou^b, A.P. Mouritz^b

^b*Sir Lawrence Wackett Aerospace Research Centre, School of Aerospace, Mechanical & Manufacturing Engineering, RMIT University, GPO Box 2476, Melbourne, VIC 3001, Australia*

* Corresponding author.

ABSTRACT

A multi-layer polymer metal laminate (PML) system is described, which can be used to thermally insulate lightweight structural materials, such as aluminium or carbon fibre reinforced plastic (CFRP) composite, when exposed to fire. The system comprises many thin adhesively-bonded metal foils, bonded directly to the structural substrate. When exposed to fire the PML adhesive thermally decomposes with the generation of volatiles, causing the foils to delaminate and inflate, thus greatly reducing its thermal conductivity. The expanded PML slows heat transfer from the fire into the structural substrate, resulting in lower temperatures and increased structural survivability. The fire protection effects of two different thicknesses of PML are demonstrated here for both aluminium and CFRP substrates. Fire exposure tests demonstrate that the substrate temperatures are reduced and the time to failure under load is substantially improved. The protection offered is equivalent or superior to conventional fire protection materials such as ceramic fibre mat or intumescent coatings. The advantage of the PML is that, in non-fire conditions, it contributes to the appearance and load-bearing capability of the structure without being prone to damage or water absorption.

KEYWORDS: fire protection, multi-layer laminate, composites, CFRP, aluminium, structural survivability

Download English Version:

<https://daneshyari.com/en/article/828085>

Download Persian Version:

<https://daneshyari.com/article/828085>

[Daneshyari.com](https://daneshyari.com)