

Enhancing the fire resistance of ablative materials: role of the polymeric matrix and silicon carbide reinforcement

J. Abenojar Buendia; M.A. Martínez Casanova; S. López de Armentia
Hernández

Abstract-

The primary characteristic of ablative materials is their fire resistance. This study explored the development of cost-effective ablative materials formed into application-specific shapes by using a polymer matrix reinforced with ceramic powder. A thermoplastic (polypropylene; PP) and a thermoset (polyester; UPE) matrix were used to manufacture ablative materials with 50 wt% silicon carbide (SiC) particles. The reference composites (50 wt% SiC) were compared to those with 1 and 3 wt% short glass fibers (0.5 mm length) and to composites using a 1 and 3 wt% glass fiber mesh. Fire resistance was tested using a butane flame (900 °C) and by measuring the transmitted heat with a thermocouple. Results showed that the type of polymer matrix (PP or UPE) did not influence fire resistance. Composites with short glass fibers had a fire-resistance time of 100 s, while those with glass fiber mesh tripled this resistance time. The novelty of this work lies in the exploration of a specific type of material with unique percentages of SiC not previously studied. The aim is to develop a low-cost coating for industrial warehouses that has improved fire-protective properties, maintains lower temperatures, and enhances the wear and impact resistance.

Index Terms- ablative material; wear; impact; silicon carbide; polypropylene; polyester

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