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Poly (ether ether ketone) - Silicon carbide composite adhesives for elevated temperature applications of stainless steel joints

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Poly (ether ether ketone) - silicon carbide composite adhesives for elevated temperature applications of stainless steel joints.

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Abstract:

In the present work, the performance of a series of adhesives based on poly (ether ether ketone) (PEEK)/ reinforced with micro-sized silicon carbide (SiC) particles for metal-metal joints was investigated. The size effect for SiC particles was studied by developing two composite adhesives with 3 wt. % of nanoparticles (NPs) (50-60 nm), and other with an equal amount of microparticles (MPs) (20µm). The influence of particles on retention of adhesive strength at elevated temperature was studied in detail. The inclusion of MPs increased the bond strength of adhesives almost by 2 times and 15 wt. % was found to be optimum. At elevated temperatures, the adhesive strength decreased for all compositions. Interestingly the adhesive strength of composite adhesive at 300°C was similar to the adhesive strength of virgin PEEK at ambient temperature. MPs performed better than NPs, which was correlated to agglomeration and shape of particles. SEM studies revealed that inclusion of hard fillers led to crack growth inhibition and resisting shearing during lap shear test of joints.

Keywords: Metal-metal joints; elevated temperature adhesives; PEEK; Raman spectroscopy

1. Introduction

Adhesive bonding is increasingly being applied in various sectors such as automotive, aircraft, microelectronics etc. over other conventional joining techniques such as welding, bolting and riveting [1–5]. One of the major concerns in joining polymer and metal is the durability of such joints, especially at elevated temperatures. Under such harsh conditions,

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