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EFFECT OF POST-CURE TEMPERATURE AND DIFFERENT REINFORCEMENTS IN ADHESIVE BONDED REPAIR FOR DAMAGED GLASS/EPOXY COMPOSITES UNDER MULTIPLE QUASI- STATIC INDENTATION LOADING

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Abstract:

This paper investigates the individual and associated effects of post cure-temperature and reinforcement phases on the local bending response of adhesive reinforced repairs in damaged glass/epoxy composite laminates. Multiple quasi-static indentation tests were performed on repaired composite laminates: damage propagation, absorbed energy and residual deflection data assisted in the evaluation of phase changes, which cause the transition from brittle to ductile nature and control the visco-elastic behavior the material is undergoing under the influence of temperature. Three phases of fiber reinforcements, namely particulate glass fibers, chopped short glass fibers and continuous glass fibers, were tested to study the fiber reinforcement's effect on indentation strength and damage mechanism. The effects of post-cure temperature on the local bending response of the repaired glass/epoxy specimens were investigated by performing indentation tests on laminates exposed to post-cure at ambient temperature (30ºC) and elevated temperatures up to glass transition temperature of epoxy resin (50, 70 and 90ºC). Multiple quasi-static indentation test results indicated that the post-cure temperature and fiber reinforcements have considerable effect on the indentation response of the repaired specimens. Damaged glass/epoxy specimens repaired using chopped short fibers and exposed to a post-cure temperature of 50ºC showed the most favorable indentation behavior.

Keywords: Composite repair, post cure temperature, adhesive reinforcements, multiple quasi static indentation tests.

1. INTRODUCTION

The use of fiber reinforced composite laminates in automobile, aerospace and marine components is increasing considerably as they offer major advantages like light weight, corrosion resistance, excellent fatigue life and the potential for reparation. Despite these advantages, composite laminates are vulnerable to damage caused due to transient impact events, such as Foreign Object Damage (FOD), while in service life and during maintenance operations [1]. Physical damage in laminate composites degrades their mechanical properties and hence