

Water absorption and desorption behaviour and their effect on the tensile properties of fm 73m adhesive film

Sugiman, author

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Abstrak

Structural adhesives have been widely used to join metal to metal, and metal to composite in automotive and aircraft structures. However, the adhesive is susceptible to water absorption from the surrounding environment and this affects the mechanical properties of the adhesive, leading to reduction in the performance of the structure. This paper investigated the water absorption and desorption behaviour of FM 73M structural adhesive film and its effect on the tensile properties. The adhesive was immersed in deionised water at a temperature of 50oC. A gravimetric method was carried out to obtain the water uptake. Dog bone specimens were used to investigate the residual tensile strength of the adhesive. Finite element modelling was performed to model the spatial moisture distribution in the adhesive and the residual tensile strength after having absorbed water. It was found that the water absorption of FM 73M deviated from Fick's second law, however the desorption behaviour followed Fick's second law. The tensile properties of the adhesive (the tensile strength and the elastic modulus) tend to decrease with the increase of water content and they are recovered after desorption at the same temperature as the absorption. The residual tensile strength was predicted using a continuum damage approach combined with environmental degradation. Good agreement has been found between the predicted and the experimental results.