

## Accepted Manuscript

On the rate dependent behaviour of epoxy adhesive joints: experimental characterisation and modelling of mode I failure

M. Lißner, E. Alabort, H. Cui, A. Pellegrino, N. Petrinic

PII: S0263-8223(17)33160-4

DOI: <https://doi.org/10.1016/j.compstruct.2018.01.019>

Reference: COST 9259

To appear in: *Composite Structures*



Please cite this article as: Lißner, M.L., Alabort, E., Cui, H., Pellegrino, A., Petrinic, N., On the rate dependent behaviour of epoxy adhesive joints: experimental characterisation and modelling of mode I failure, *Composite Structures* (2018), doi: <https://doi.org/10.1016/j.compstruct.2018.01.019>

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.

# On the rate dependent behaviour of epoxy adhesive joints: experimental characterisation and modelling of mode I failure

M. Lißner<sup>a</sup>, E. Alabort<sup>a</sup>, H. Cui<sup>a</sup>, A. Pellegrino<sup>a</sup>, N. Petrinic<sup>a</sup>

<sup>a</sup>*Department of Engineering Science, University of Oxford, Parks Road, Oxford, OX1 3PJ, United Kingdom*

---

## Abstract

The increasing use of adhesive joints in dynamic applications require reliable measurements of the rate-dependent stress-displacement behaviour. The direct measurement of the stress-displacement curve is necessary when using cohesive models in discretised solutions of boundary value problems in solid mechanics. This paper aims to investigate the rate-dependent tensile failure of adhesive joints by using a new experimental methodology – it relies upon the combination of the stress wave propagation theory and digital image correlation methods on high speed footage to quantify the tensile stress and the dissipated energy respectively. For this purpose, the Split Hopkinson Bar methodology was employed – the experimental configuration was optimised using numerical modelling. To prove the sensitivity of our framework, two different adhesives are characterised at different loading rates: the adhesive failure strength was found to increase considerably with the strain rate, while the plastic deformation of these adhesives was reduced. The film adhesive showed superior performance over the particle toughened one. In the final part, a rate-dependent cohesive zone model is proposed, one which captures the measured behaviour and which has the potential to be used in industrial applications.

*Keywords:* adhesive joints, rate-dependent, dynamic characterisation, cohesive zone model

---

## 1. Introduction

Composite materials are increasingly used in modern aerospace [1] and automotive structures [2]. The increased integration level of composite structures is beneficial to its affordability and development efficiency; adhesive bonding has been widely used for manufacturing integrated composite structures [3]. Some typical composite joints have been comprehensively investigated, such as single lap joints [4], double lap joints [5] and T-joints [6]. The strength and damage tolerance

Download English Version:

<https://daneshyari.com/en/article/6703957>

Download Persian Version:

<https://daneshyari.com/article/6703957>

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