



THE UNIVERSITY *of* EDINBURGH

Edinburgh Research Explorer

Virtual testing framework for accelerated development of composite structures for impact applications: Experiments and simulations

Citation for published version:

Martinez-Hergueta, F, Kok, R, Ares, D, Ridruejo, A & Petrinic, N 2019, 'Virtual testing framework for accelerated development of composite structures for impact applications: Experiments and simulations', The 4th China International Congress on Composite Materials, Zuhai, China, 28/11/19.

Link:

[Link to publication record in Edinburgh Research Explorer](#)

General rights

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.



Virtual testing framework for accelerated development of composite structures for impact applications: Experiments and simulations

*Francisca Martínez-Hergueta¹, Rutger Kok¹, D. Ares², A. Ridruejo², Nik Petrinic³

¹ School of Engineering, University of Edinburgh, UK (Francisca.mhergueta@ed.ac.uk)

² Technical University of Madrid, Spain

³ Department of Engineering Science, University of Oxford, UK

Composite materials are widely used for aeronautical applications due to their specific stiffness and strength, however, they present a very brittle response against impact [1]. The development of numerical models that can accurately predict the physics involved during the impact event is critical to accelerate the design of composite structures. The present research is focused on the development of a validated numerical framework able to capture the non-linear response and strain rate dependency of the composite to predict the final energy absorption capacity. Special emphasis has been given to the experimental and numerical characterisation of composites subjected to high strain rates, including the technical challenges of the dynamic experimental techniques, the complex micromechanical response and the implementation of constitutive laws to predict the catastrophic failure of structural components against impact. Finally, the implementation of this approach for aerospace applications will be explored, including quasi-static, dynamics and low velocity impact testing [2].

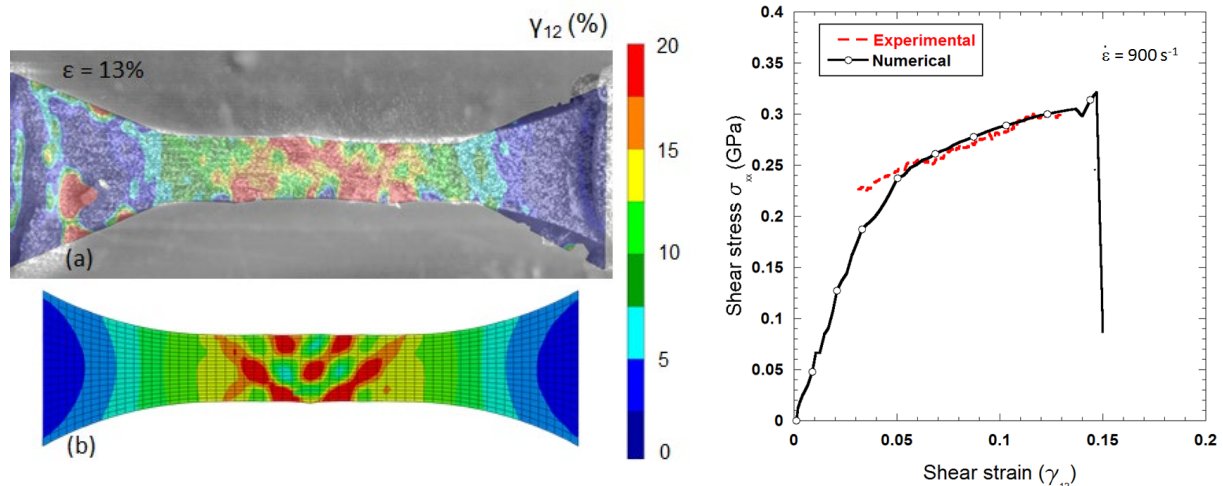


Fig. 1 (a) Experimental engineering shear strain for 13% applied deformation for a 8HSS2/Epoxy composite at quasi-static and high strain rate (900 s^{-1}) and (b) numerical correlation. (c) Correlation between the representative shear engineering stress vs engineering strain curves.

References

- [1] Hou, J.P, Petrinic, N., Ruiz, C., Hallett, R. *Comp. Sci. Tech.* 60 (2000) 273–281.
- [2] Martínez Hergueta, F., Ares, D., Petrinic, N., *Comp. Struct.*, 210, (2019) 840–857.