

Supplementary Information to “Effect of Angled Layers on Failure Regimes in Brick-and-Mortar Structures”

Georgia Hunter¹, Lee Djumas¹, Laurence Brassart^{1,2}, Andrey Molotnikov^{1,3}

¹Department of Materials Science and Engineering, Monash University, Clayton, Australia

²Department of Engineering Science, University of Oxford, Oxford, UK

³RMIT Centre for Additive Manufacturing, School of Engineering, RMIT University, Melbourne, Australia

e: Georgia.Hunter@monash.edu

SI 1. Defect Size Sensitivity Analysis

The size of the introduced defect was found to only affect the yield strength of the response, and not the failure regime of the response. The size of the defect used in the model was therefore determined by performing a size sensitivity analysis where the yield stress was monitored against defect size. Results show the yield stress plateaus at a defect of 0.1% reduction in strength for both a diamond shape (positive angle, α) and an inverse diamond shape (negative angle, α) structure, see Figure S1. A defect of 0.1% was therefore used for all simulations of the semi-analytical model.

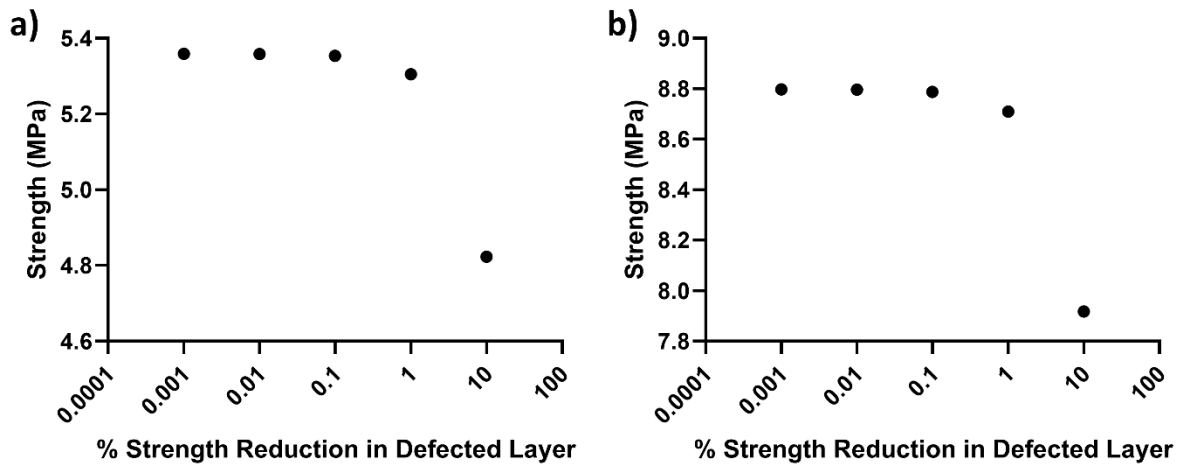


Figure S1: Brick-and-Mortar semi-analytical model defect sensitivity analysis for a) a diamond shape structure and b) an inverse diamond shape structure. Both results show a plateau in composite strength for a strength reduction in the defected layer of 0.1%.

SI 2. Representative Properties for VW+ and TB+

Representative stress-strain plots for TB+ and VW+ are taken from our previous work [1] and provided in Figure S2. The TB+ properties are determined from Layered Tensile Tests (LTT) to best capture the properties of the TB+ in layer form, which is the form it takes in the Brick-and-Mortar structure, while the VW+ properties are determined using the standard tensile test ASTM D638-10.

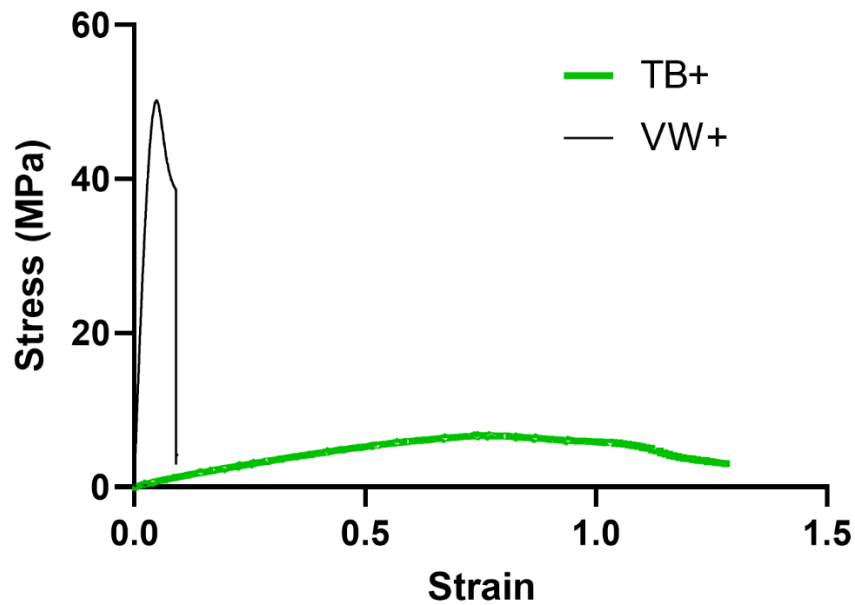


Figure S2: Representative stress-strain response for TB+ and VW+.

SI References

1. Hunter, G., et al., *Controlling failure regimes in Brick-and-Mortar structures*. Extreme Mechanics Letters, 2021: p. 101596.