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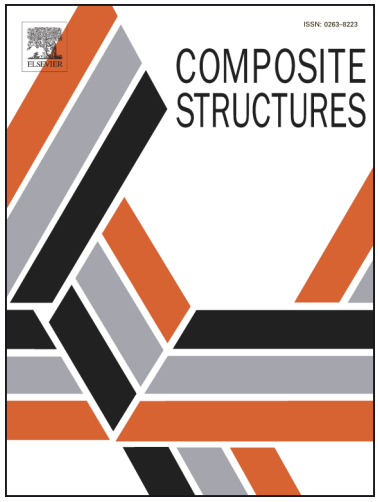


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Tao Li, Xia Yu, Huifang Liu, Hongsheng Yang, Yulong Li

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# Tensile behavior of C/SiC composites plate after hypervelocity penetration: residual strength and fracture mechanism

Tao Li[a], Xia Yu[a], Huifang Liu[a], Hongsheng Yang[a], Yulong Li[a,b,*]

[a] *School of Aeronautics, Northwestern Polytechnical University, 127 Youyi Xilu, Xi'an 710072, China*
[b] *Fundamental Science on Aircraft Structural Mechanics and Strength Laboratory , Northwestern Polytechnical University, Xi'an 710072, Shaanxi, China*

**Abstract**

The damage and tensile mechanical behavior of C/SiC composites plate after hypervelocity penetration are studied in this paper. Hypervelocity penetration is applied along the out-of-plane direction by an electrical gun at 3.5 $\mathrm{km\,s^{-1}}$, and the target is recovered for damage observation and tension test. Quasi-static tensions on the recovered targets and the slices cut from damage zone are examined along with high-speed photography. Moreover, corresponding numerical simulations are carried out. The damage zone in the vicinity of the penetration hole is small (∼10 mm), and the damage mode involves SiC matrix fracture, delamination, fiber bundle splitting and fiber breaking. The simulation results suggest that the degree of damage decreases exponentially with the increasing distance from the penetration hole center of the target plate. As the degree of damage increases, the tensile strength of C/SiC composites decreases and the corresponding fracture mode changes from shear failure to tensile breakage. Additionally the fracture surface becomes smoother, the quantity and length of fiber pullout also increases. Since the decrease of elastic modulus induced by damage weakens the stress concentration effect of the penetration hole, the residual strength of recovered target plate is only reduced from 241 MPa to

*Corresponding author
*Email address:* liyulong@nwpu.edu.cn (Yulong Li)



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