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Experimental and Finite Element Investigation of Glass-Fiber Composite Plates under Shock Loading

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The increasing demand for lightweight structures across various engineering sectors has driven a significant surge in the use of composite materials. However, predicting the behaviour of these materials under extreme conditions remains a critical challenge. Composite materials are inherently difficult to model due to their anisotropic behaviour, layered architecture, and complex damage mechanisms. Furthermore, blast and shock loading present additional analytical difficulties owing to their highly dynamic nature. Despite these critical issues, the literature concerning composite plates subjected to shock loading remains strictly limited. To bridge this gap, this work presents a comprehensive experimental and numerical study on glass-fibre-reinforced composite plates exposed to shock loads. The experimental campaign encompasses tests at varying pressure levels to evaluate the structural response under escalating loading severity. Concurrently, finite element models have been developed to replicate the experiments and assess their accuracy in capturing the key features of the structural response. A rigorous comparison between empirical data and simulations is employed to gauge the effectiveness of the numerical approach and to deepen the understanding of composite behaviour under shock.

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