

Ballistic performance of wadded angle-interlock fabric panels with different plies and orientations

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Abstract:

Aiming at the discontinuity of the reinforcing materials in modern ballistic helmet, angle-interlock fabrics are used to enhance the ballistic performance with required continuity and curvature. This study is set to investigate the mouldability and ballistic performance of wadded through-the-thickness angle-interlock (TTAI) fabrics. Composite panels using wadded TTAI fabrics with different fabric plies and orientations are also compared to identify the optimal structure for ballistic helmets. The fabric mouldability was evaluated and experimentally tested, and high velocity ballistic impact test was carried out to find the ideal fabric structures for constructing ballistic helmet shells. The results show that the mouldability of the wadded TTAI fabrics is almost the same as the conventional counterpart, whereas the wadded TTAI fabrics demonstrate a significant increase of 34% in ballistic energy absorption and 3% increase in the estimated ballistic limit. Such results indicate satisfactory mouldability and improved ballistic performance over the existing helmet panels as well as the conventional TTAI fabric reinforced helmet panels, which can be used as an effective continuous reinforcement for ballistic helmet shells. In addition, the ballistic impact test will also be conducted for multi-ply TTAI composite panels, which are made from wadded TTAI fabrics with various plies and orientations. The ballistic performance of those composite panels are due soon. The composite panels with the same thickness composed of different TTAI fabrics will be further investigated in future research.