Numerical analysis of UHMWPE's multi-layered combinations

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Abstract

The rapid increase of protecting grades of personal armour gears for bodyguards, security forces and civil population has been given by the rise in parallel of military risks. Thus, materials as para-aramids and UHMWPE have been developed and analysed rapidly by numerous researchers due to its huge energy absorption's capacity when impact situations occur.

The industry needs non-sofisticated model that can be easily used to analyse and compare different UHMWPE configurations to find the optimal solution to each threat. Nevertheless here is stucked the gap between the academic research and industry requirements. This work introduces a versatile numerical model that may be effortlessly calibrated to reproduce the ballistic performance of UHMWPE protections in order to align both science and industry.

The model was validated analysing the number of perforated layers when impact velocities were going under its ballistic limit (V50) [1, 2], and comparing Lambert-Jonas regressions among experimental tests carried out on three different qualities for UHMWPE and numerical results. These high velocity impact were conducted on single and multi-layered configurations. Finally, the optimal solution was reached using the numerical model by mixing this three validated materials.

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