
Steps toward characterizing and modeling UHA steels for armor design purposes

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Abstract

In recent times, the focus of armor applications was on the mass-efficient protection against fragments and projectiles from small arms. Ultra-high hardness armor (UHA) steels were developed for that purpose. Nonetheless, potential future lightweight solutions against larger threats are expected to benefit also from the hardness and the strengths of those most recent armor steel grades. It is therefore of great interest to fully characterize UHA steels regarding the mechanical behavior under impact loading. The presentation provides an overview of a multimethod approach applied to the characterization of different UHA steels. Besides ballistic testing, material testing at different strain rates – from quasi-static tensile testing up to highly dynamic planar-plate-impact tests – is presented. Those experiments provide a basis for the derivation of material models and model parameters used in numerical simulations. Once validated, such simulation models are applicable in hydrocode studies aiming at assessing and designing new mass-efficient thus lightweight armor configurations. In the present contribution, we compare results obtained for ARMOX 600, ARMOX ADVANCE and ULTRAFORT 6355 to SECURE 500, i.e. to a reference material from the high-hardness armor (HHA) class. Prior work of Refs. [1, 2] is extended by additional methods of testing that aim at further improved material modeling.

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References

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