Ceramics and Armours: the state of the art in ceramic armours and future potentials in Turkey

Abstract

Ceramics with their intrinsic properties became material of choice for ballistic protection against armor piercing rounds in body armour and aircraft platforms. With increasing asymmetric warfare situation armies increasingly looking for better armor protection, thus survivability and ballistic protection became the main factor for land vehicle designers. The lighter and higher protection capability composite armors increasingly relied on ballistic ceramics and polymeric composites for protection against light to medium caliber direct fire threats and improvised explosive device (IED) threats in the last 20 years. With the wide spread use of anti-armor shape charge threats ballistic ceramics found a new application field in passive armors providing better performance in some aspects accordingly becoming an alternative to reactive armor for armored vehicles. Turkey with significant number of armored vehicle manufacturers has great requirement and potential for armor development and production. Al_2O_3, SiC and B_4C constitutes the bulk of the ballistic ceramic market with significant research going into reducing price and increasing performance of these materials. On the other hand so called nano-ceramics and novel ceramic composites and 3D printing techniques allowing bio-mimicking structures combining two or more materials requires special attention for future armor applications. In this review a brief summary of ballistic ceramic evolution will be given followed by current market shares and future trends will be explored.