ELECTROPHORETIC DEPOSITION OF B_4C/Al CERMETS IN A 3D GEOMETRY WITH GREATER CURVATURE FOR APPLICATIONS IN ARMOR SYSTEMS

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Armor technology in aircraft, vessels, vehicles, and personnel are improved by increasing performance, operational supportability, and survivability. Industrial production of armor is facilitated when coupled with a flexible and affordable manufacturing process (such as EPD). Ceramic/metal composite materials are attractive for armor applications for they combine the hardness of ceramics and the toughness of metals. Armor shaped by ceramic tiles and concave plates are in service. Yet ceramic armor is largely 'flat' when compared to the curvature required to provide additional protection of soldier extremities; or enable 3D geometries in air, land, and sea vehicle parts that are both functional and structural.

Boron carbide is one of the lightest and hardest ceramics known. Introducing Al into the microstructure of boron carbide creates an ideal low porosity armor that is lightweight, hard, and tough. The conformal nature of the EPD process enables ceramic parts to be made that take the shape of the working electrode. High green body densities of EPD processed parts translate to less reduction in volume during sintering; thus enabling the formation of near net shaped B_4C/Al cermet armor parts. These parts can then be incorporated into armor systems for increasing performance, operational supportability, and survivability of both service personnel and vehicles. We report the creation of B_4C/Al cermets in simple 3D geometries produced by EPD to demonstrate how it can be used to make shaped parts of greater curvature for armor applications.

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