

Enhanced Manufacturing Processes for Body Armor Materials

PROBLEM / OBJECTIVE

In the 1990's, body armor plates used by Soldiers were extremely heavy, reducing the Soldier's mobility and dramatically increasing their fatigue. This resulted in decreased fighting capability and increased casualties.

Lightweight, state-of-the-art ceramics were the material of choice for new body armor, but manufacturing costs were very high - up to \$850/plate. This project was a joint venture between the Army and Marine Corps to find an economical and lightweight replacement for the body armor currently used in the field.

Now fielded, Small Arms Protective Insert (SAPI) plates are an integral part of the Interceptor Body Armor (IBA) system used by the Army and Marine Corps.



Implementation and Technology Transfer:

This project has been implemented on the multi-service Interceptor Body Armor. Together, the Army and Marine Corps have procured more than 500 thousand plates, and are fielding them to troops stationed around the world.

Expected Benefits and Warfighter Payoff:

Through this ManTech effort, the cost of the SAPI decreased from \$850 per plate to \$525 for boron carbide plates and processes implemented to produce functionally equivalent siliconized silicon carbide plates for as low as \$350 per plate. To date, this project has resulted in a cost avoidance of more than \$150M for the Army and Marine Corps. Success has been demonstrated in Afghanistan and Iraq with hundreds of lives saved.

ACCOMPLISHMENTS / PAYOFF

Process Improvement: SAPI plates are manufactured from either boron carbide or silicon carbide. Both are currently in production.

Boron carbide ceramic is extruded in a tube, then cut roughly to size. The plates are rolled to the correct thickness in a slab roller, then layered with graphite molds. Finally, a stack of 28 plates is placed in the furnace, which compresses the plates while heating them to finish the process.

Reaction bonded silicon carbide (si/sic) tiles are preformed with a high sic and low resin content.



Old style aluminum oxide ceramic plate



Siliconized Silicon Carbide - final assembled plate

TIME LINE / MILESTONE

This project ran from October 1997 to May 2001.

FUNDING

Army ManTech Funding: \$0.450M.
Cost Sharing was also received from:
PEO Soldier - \$0.570M,
Marine Corps - \$0.230M
Cercor Inc. - \$0.225M

PARTICIPANTS

Cercor Inc.
Simula Inc.
Specialty Defense
U.S. Army RDECOM Natick Soldier Center
U.S. Marine Corps