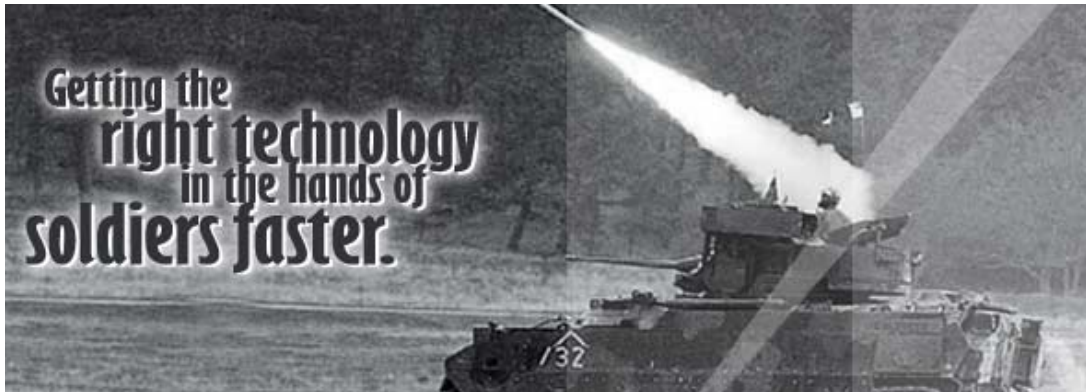




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Transparent Armor – Will it be the next diamond in the rough?

By Ashley John
Tank Automotive Research, Development and Engineering Center

Safeguarding the Army by means of transparent armor has been on the military's wish list since the 1960s, and the solution may be closer than people think. The Army's Tank Automotive Research, Development and Engineering Center has partnered with industry to develop a lightweight, transparent ceramic armor that can be applied in both military and commercial settings. Transparent armor solutions are at the forefront of an evolutionary transition into a major technological collaboration between military and industry.

TARDEC and Industry are taking a look at new, nano-structured advanced protection technologies for ground vehicle systems. Developing unique, nano-engineered armor materials for armor systems through the combination of mechanical, optical and sensing properties, allows for wide application uses.

The key requirements of complex protection systems are: materials with high mass efficiencies, superior strength, damage tolerance under multiple impact conditions, and in the case of transparent armor – a very low distortion rate. Rapid progress in nanotechnology provides a unique opportunity to procure a tailor-made material with properties that surpass current transparent armor.

During the summer of 2005, Nanocerox, Inc., a small tech-focused business based in Ann Arbor, Mich., and lead partner General Electric Company's Global Research Center, received a \$4 Million dollar appropriation from Congressman John D. Dingell, to be used in the development of next generation transparent armor. Congress set aside the funds in the Defense Appropriations which will support research in nano-structured armor materials.

Developing advanced transparent armor solutions is the purpose of the research, but ensuring that the nano-structured solution is cost effective is where TARDEC is taking the lead. TARDEC, along with GE Global Research, Nanocerox, Inc., TACOM Life Cycle Management Command's Cost and Systems Analysis Team, Army Research Laboratory, and the Program Manager for Light Tactical Vehicles, is collaborating on a ground breaking cost study to develop the break-even point for advanced transparent armor versus conventional transparent armor.

The cost for current ballistic armor is substantial; with over a million dollars a month in material costs alone. Cost is not the only reason for researching transparent armor solutions. The current ballistic glass adds hundreds of pounds to military vehicles, with the potential to have high levels of distortion and glare.

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Both of these concerns can and may be eliminated through the development of nano-structure transparent ceramic armor. The weight will be greatly reduced, while continuing to increase the protection level for the Warfighter.

Transparent ceramic armor will be stronger, harder, and lighter in comparison to conventional transparent armor due to its structure.

"Through nanotechnology research and development, we will be able to increase ballistic capabilities of transparent armor," added Steve Swanson, Nanocerox chief executive officer.

"There is potential to achieve the accelerated development of advanced transparent ceramic materials by making this a military, small business and GE Global Research effort," said Dr. Richard McClelland, TARDEC director.

"The work done at Nanocerox is on the cutting edge of 21st century armor for our troops," Dingell said. "I am confident that this work will lead to better, more advanced armor solutions getting to the brave men and women in the United States military."

The project entails the development of both opaque and transparent armor solutions through the use of nanotechnology. "The armor will be serviceable to light and heavy combat vehicles, aircrafts and missiles, and face and body shields that can be used for Warfighter protection," Swanson said. "The uses of this product are endless. Transparent armor would have many applications in Homeland Defense and law enforcement vehicles. It would also have architectural design application where increased strength is required to deal with man made and natural threats."

TARDEC has been an integral player in bringing nanotechnology government and industrial researchers and PM-LTV together to ensure that this is a coordinated military and industry effort, and that the path to procurement is established and Armored with the Next. As a result of Congress, the Army and industry are at the forefront of ground breaking developments in nano-structured transparent armor. Armoring the Army has evolved into an operational requirement.

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