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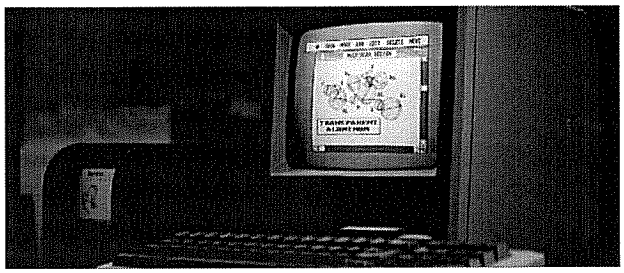
Spinel Transparent Aluminum Armor (Body/Facial Armor and Vehicle Armor) and Optics for Future Soldiers/Warfighters!

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Photo(s) Credit: New Defions/Arsenal Democracy (AD)

November 8, 2015



Well, it looks like yet one more *Star Trek* technology has made it to reality in the form of transparent aluminum, that can potentially be used to create transparent armor that will protect the future soldier/warfighter. Every *Star Trek* fan, your humble correspondent included, remembers the scene in *Star Trek: The Voyage Home* where Scotty shows one very lucky Dr. Nichols the secret (future) formula for transparent aluminum that allows a 1″-thick panel of aluminum armor to accomplish the same thing as a 6″ piece of plexiglass of the time. If I'm being honest, it was my favorite scene in the whole movie, since I'm a tech geek, as well as a gun geek, at my core.

Cut to 2015, where a number of science and technology publications, including *ExtremeTech*, *Ubergizmo* and *Discovery News* have reported on U.S. Naval Research Laboratory (NRL) scientist Dr. Jas Sanghera's development of transparent ceramic aluminum armor technology called "spinel", or magnesium aluminate spinel, which can potentially be used to create everything from tranparent vehicle and body armor (facial armor or face shield, specifically) to lightweight, super-tough optical glass and ruggedized/shatterproof smartphone display screens. The manufacturing process for the new spinel material is apparently a low-temperature process called "sintering", where powdered magnesium aluminate ceramic crystal particles are pressed together, forming an extremely strong and transparent polycrystalline material. Spinel can chip, but it won't crack like glass.

The commercial version of spinel is made by Surmet, and is called, appropriately, Spinel Optical Ceramic, which appears to be a product-improved version of ALON (Aluminum Oxynitride) Optical Ceramic/Armor, which can be used to make monolithic windows up to 18" x 35" in size. However, a newer product called SUPERSPINAL Optical Ceramic is available that "transmits out further into the MWIR than both the ALON® Optical Ceramic and Sapphire." Here's the info on it from the company's website:



"SUPERSPINEL™ is made through solid-state sinter and HIP processes, similar to Surmet's ALON®. These processes yield a high strength product without the grain boundary weaknesses known to occur in LiF hot-pressed spinel. Surmet's robust, vertically-integrated process (from SUPERSPINEL™ powders synthesized in-house to precision optical finishing) provides excellent optical quality with no inclusions.
Surmet's SUPERSPINEL™ is a highly durable polycrystalline ceramic with optical transparency from the near ultraviolet through the mid-wave infrared (MWIR) spectrum. Surmet is developing this material in the form of blanks and finished optics components using its own proprietary processes. Target applications include Infrared optics such as domes, lenses, sensor windows, reconnaissance windows, etc.

Surmet's SUPERSPINEL™ Optical Ceramic
– Optically transparent from near-ultraviolet through mid-wave infrared frequencies with mid-IR transmittance comparable to that of sapphire
– Can be produced in a wide variety of shapes, sizes and thicknesses
– Fabricated using proven ceramic processing techniques
– Ideal material for precision optical components"

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