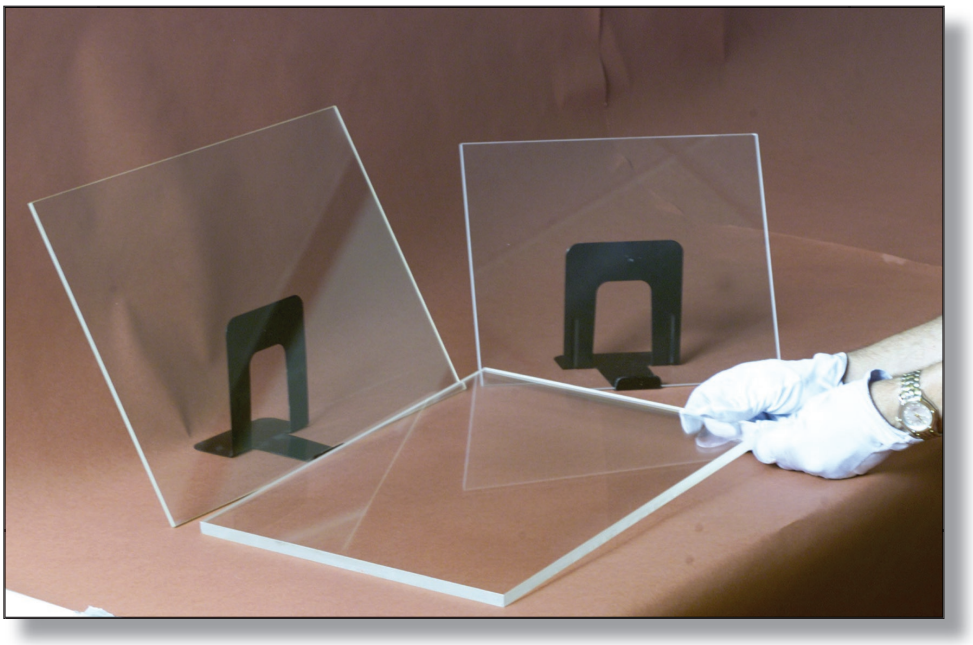
Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force

Success Story

ALON™ MATERIAL SUCCESSFULLY SCALED UP FOR MILITARY AND COMMERCIAL APPLICATIONS



Polycrystalline aluminum oxynitride, known commercially as ALON, offers performance and scaling not otherwise possible for large, lightweight, infrared (IR) transparencies. This new technology could play a significant role in the development of affordable, transparent armor, including windows for military aircraft, where trimming life-cycle costs could save millions while providing greater protection for flight crews.

Other primary military applications include forward-looking infrared windows, missile domes, underwater sensors, and personnel protection. Promising commercial applications include supermarket scanner windows, semiconductor equipment components, vehicle transparent armor, various types of lighting, and scratchproof lenses.

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Accomplishment

Engineers at the Materials and Manufacturing Directorate, working with Raytheon Electronic Systems, completed an advanced development effort to evaluate forming techniques and optimize fabrication processes for a tough, lightweight, transparent ceramic material that offers outstanding potential for both military systems and commercial products. ALON addresses a wide range of technological interests throughout the Department of Defense and other federal agencies as well as private industry.

As part of the advanced development effort, the engineers fabricated several 14 in. x 20 in. ALON plates for flight testing, ballistics testing, and transparent armor applications. Their efforts demonstrate that ALON has excellent mechanical and optical properties and provides a number of advantages when compared to conventional transparent armor including dramatic life-cycle cost savings.

Background

ALON, a polycrystalline ceramic material comprised primarily of aluminum oxynitride, is a very durable optical material with a high degree of transparency from the ultraviolet through the mid-IR wavelengths. ALON is equivalent to sapphire in terms of optical quality, low density, high strength, and high durability, but it is also an isotrophic ceramic, making it scalable by conventional powder-processing methods.

ALON has a number of significant advantages, as previously mentioned, over conventional materials currently used to make windows for reconnaissance aircraft, missile domes, protection shields and lenses, and other products that support the warfighter. A potential market for its use already exists in supermarket scanner windows, which are manufactured in quantities of tens of thousands of units per year. Field testing is under way for this technology transfer.

ALON demonstrated outstanding ballistic impact resistance for safeguarding motor vehicle occupants. As a result of these findings, engineers are evaluating ALON for possible insertion into ground-based transparent armor. Raytheon Electronic Systems at Lexington Laboratories, Lexington, Massachusetts, owns the patent. However, Surmet Corporation of Burlington, Massachusetts, recently acquired ALON from Raytheon and has begun manufacturing the ceramic for commercial and military applications.

Materials and Manufacturing
Technology Transfer

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (03-ML-17)