



Defense-Wide Manufacturing Science & Technology (DMS&T) Program



Transparent Ceramics - Sapphire

PROBLEM / OBJECTIVE

- Sapphire is used as a transparent ceramic for opto-mechanical and armor applications in multiple DoD platforms, including tactical vehicles and aircraft.
- Current sapphire production capacity will not meet projected demand for F-35 Electro Optical Targeting System (EOTS) full rate production. The external EOTS sensors use 7 sapphire windows per aircraft for protection (see photo below).
- Bubbles larger than .040" and clusters of smaller diameter bubbles account for 24% of yield loss for EOTS sapphire windows

APPROACH / BENEFITS

Approach

- Increase large sheet sapphire (up to ~ 13" x 28") production capacity while increasing yields.
 - Develop ability to grow multiple panels simultaneously from the same machine
 - Reduce occurrence of bubbles in crystal growth process
 - Increase sapphire crystal growth speed



F-35 EOTS



M142 HIMARS

Expected Benefits and Warfighter Impact

- Sapphire sheet production process improvements will transition to current and next generation DoD applications.
 - Two 9"x21" sapphire sheets (used by EOTS windows) will be able to be grown simultaneously, increasing throughput 100%.
 - Bubble defects are expected to be eliminated, removing 24% of all defects.
- Applications
 - Large sapphire panels for the F-35 Electro-Optical Targeting System (EOTS)
 - Windows on High Mobility Artillery Rocket System (HIMARS)
 - Other applications which use sapphire panels

POINT OF CONTACT

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