

## Low Cost Zinc Sulfide (ZnS) Missile Dome Manufacturing

### PROBLEM / OBJECTIVE

Warfighters need lower cost, more durable multi-mode missile domes for long range (40km) missiles. State-of-the-art multi-mode seekers with uncooled Infrared (IR) and Semi-Active Laser (SAL) capabilities use these domes. The missile dome hardness and transmittance characteristics are critical to the proper operation of the seeker sensors.

One material considered for IR domes is ZnS, but current processes involve Hot Isostatic Pressing (HIP), which is prohibitively expensive and time consuming. The dome is a significant portion of the total seeker cost.

This Army ManTech project, in collaboration with Raytheon Missile Systems, developed and proved out new chemical and manufacturing process for ZnS.

### ACCOMPLISHMENTS / PAYOFF

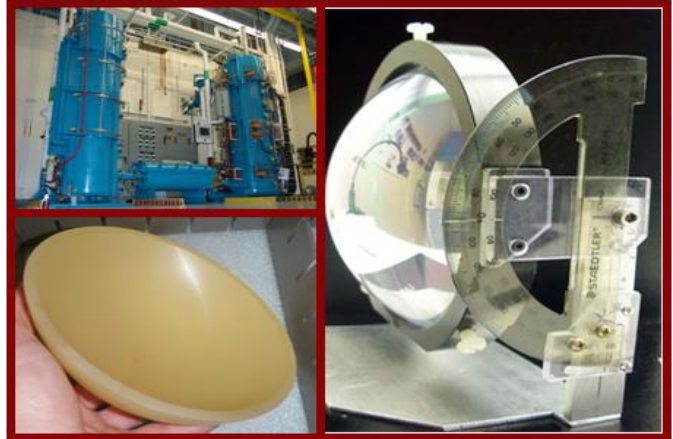
#### **Process Improvement:**

This project successfully incorporated the use of applied physics, chemistry, materials science, and manufacturing engineering to derive state of the art manufacturing capability for growing and finishing material that is stronger, more safe, efficient, and affordable.

This program has made significant findings in the reactions of ZnS material to different manufacturing processes, and has enabled the DoD to purchase ZnS domes for less cost. New manufacturing techniques were discovered and documented for both HIP and elemental material chemical vapor deposition (CVD).

The results of the ManTech program can apply to multiple facilities across the United States, and these results are Government owned and will be shared with companies who could benefit.

The discoveries resulting from this program have enabled new multi-mode missile designs to be more affordable and manufacturable.



#### **Implementation and Technology Transfer:**

The technology was transitioned to PM Joint Attack Munitions (JAMS) during 2012. DoD systems that could potentially benefit from this technology are the Joint Air to Ground Missile (Army/Navy), Small Diameter Bomb II (Air Force), the Army's Modernized Target Acquisition Designation Sight/Pilot Night Vision Sensor, and the Javelin man-portable anti-tank missile (Army/Marines).

#### **Expected Benefits and Warfighter Impact:**

A 25% yield improvement, 65% lead time improvement, 45% strength enhancement, and 65% cost reduction were demonstrated as a result of this project.

The warfighter impact is a potentially higher kill ratio due to the elimination of ZnS abrasion, and better performance achieved in rain and snow environments.

### TIMELINE / MILESTONE

Start Date	August 2007
End Date	July 2012

### FUNDING

U.S. Army ManTech	\$8.0M
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### PARTICIPANTS

U.S. Army Research, Development and Engineering Command (RDECOM) Aviation Research, Development and Engineering Center (AMRDEC)  
Raytheon Missile Systems, Tucson, AZ