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# LOW COEFFICIENT OF THERMAL EXPANSION HELPS OPTIC MANUFACTURERS PUT MORE ACCURACY AND RELIABILITY IN THEIR SIGHTS

DALLAS (January 2023) – Given the importance of a material's low coefficient of thermal expansion (CTE) when used for sights, Alpine Advanced Materials (Booth 51411) is drawing attention at SHOT Show to how its multi-scale reinforced polymer can tighten their focus. HX5®, which was engineered to replace machined aerospace-grade aluminum at half the weight, has a relatively low coefficient of thermal expansion compared with many other materials – a sixth that of 6061-T6 aluminum.

High-precision optics such as cameras, sensors, and laser systems all rely on highly accurate and tightly controlled positioning of lens systems to function repeatably every time. This can be affected by CTE, which defines how an object expands and contracts under temperature variation. Engineers must account for this and design around both the operating and non-operating conditions of a system.

"Non-operating conditions alone like shipment via plane, truck, or some combination mean a part will see temperatures ranging from -60°F while in the cargo compartment of a plane to +140°F inside a shipping container – that's a 200 degree difference," said Aaron Daniel, director of engineering at Alpine Advanced Materials. "Accounting for the challenges this presents to items with higher or dissimilar CTEs can be difficult, to say the least."

The difference in CTE between glass and aluminum can have significant impacts depending on the use case. In optics, high precision requires maintaining the positioning of the lens with respect to the source and the target or point of interest. Movement of the lens fore and aft will affect the focal length and the field of view resulting in less focus or an altered view, and as such, the accuracy. Where tight tolerances are required, the expansion and contraction of the housing may damage or loosen the lens through shrinkage and expansion.

"Stronger than traditionally injection-molded thermoplastics, HX5 is ideal for optics given its high tensile and compressive strength and low thermal conductivity," added Daniel. "Optics usability

can be compromised if a critical feature has moved due to temperature, which will ultimately affect the confidence consumers have in a manufacturer's product and brand."

HX5 is also extremely corrosion-resistant, with no cosmetic or performance degradation after exposure to UV, DEET, or various fuels and solvents. Tested against the harshest environments on earth, it has demonstrated resistance to temperatures as high as 500°F and as low as -65°F. In addition to handling well during the manufacturing process, HX5 maintains superior performance when coated or plated.

Known for HX5 as well as its advanced design for manufacturing services, Alpine also recently introduced Rapid Prototype Molding (RPM). A solution that dramatically reduces the time and cost of creating prototypes, RPM provides a functional and testable injection molded part using a 3D-printed mold. Additionally, Alpine provides domestically produced advanced materials, which are predictable and advantageous for supply chains. Due to the speed of injection molding, Alpine can readily manufacture and mass-produce parts in weeks versus the months typically needed for machined metal parts.

## About Alpine Advanced Materials

Alpine Advanced Materials is a leading expert in the design and manufacture of custom-engineered parts for the world's most demanding aerospace, defense, energy, space, and outdoor applications. With experience across multiple industries, a collaborative approach, and deep expertise in designing for manufacturing, Alpine delivers the future of innovation.

Alpine's flagship nanocomposite material HX5® offers the strength of aluminum at half the weight with environmental and thermal performance to withstand the harshest environments. HX5 can be formed into complex shapes and easily coated without sacrificing strength, performance or aesthetics. From prototypes to full-scale injection molding production, HX5 is an ideal alternative to the cost and production challenges associated with aluminum. For more information, visit www.alpineadvancedmaterials.com.

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