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AZ-TPS Thermal Protection of PEEK Under Constant 572 °F/300 °C Heating

Application Profile

In this application, an infinitely thick polyetheretherketone (PEEK) substrate is protected by AZ-TPS consisting of one, two, or three layers of Blueshift AeroZero® material, each layer with a thickness of 165 microns. The AeroZero film(s) are bonded to each other with a 25-micron layer of silicone pressure sensitive adhesive (PSA), and also bonded to the PEEK substrate with a 25-micron-thick layer of silicone PSA.

Methodology

While the sample was held at 20 °C, a 30-second thermal load of 300 °C was applied to the sample from a contact heat source.

The temperature at the PEEK surface (the PSA/PEEK interface) was constantly monitored to determine the rate and extent of temperature rise. The thermal load was uniformly applied at the top of the layered build.

The resultant temperature was plotted as a function of time, and shown in **FIGURE A.**

Result

With the AZ-TPS Type 1 in place, a maximum temperature of 132 °C (270 °F) was reached on the PEEK surface after 30 seconds of thermal exposure, vs 295 °C (563 °F) with PSA only—a difference of 162 °C (293 °F)! The temperature was further reduced with Type 2 and Type 3 AZ-TPS.

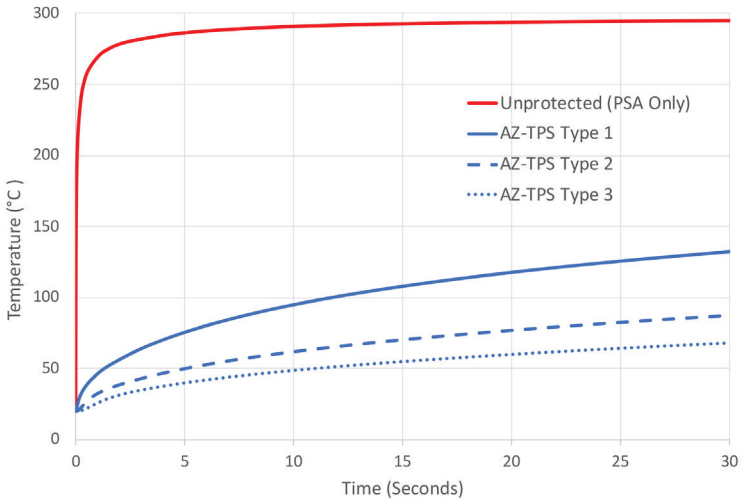

FIGURE A
Temperature as a function of time for PEEK substrate protected by AZ-TPS Types 1, 2, and 3 and PSA only (upper line).

Note that AeroZero not only reduces the rate of heating, but also lowers maximum temperatures after the thermal load is applied.

Takeaways

For products that need to be protected from the potential of a transient thermal event, AZ-TPS provides outstanding insulation against extreme temperature variations.

Blueshift products are manufactured under a certified AS 9100D/ ISO 9001:2015 Quality Management System facility.
See our website for more information on Blueshift products.

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AZ-TPS Thermal Protection of PEEK under Cyclic Heating of 300° and 500 °C, with a 5-Second Recovery.

Application Profile

This study is based on the protection of an infinitely thick polyetheretherketone (PEEK) substrate with Blueshift AZ-TPS consisting of one, two, or three layers of Blueshift AeroZero® material, each layer with a thickness of 165 microns. The AeroZero film(s) are bonded to each other with a 25-micron layer of silicone pressure sensitive adhesive (PSA), and also bonded to the PEEK substrate with a 25-micron-thick layer of silicone PSA.

Methodology

The PEEK material was subjected to a series of 10 thermal pulse cycles, each lasting 5 seconds at either 300 or 500 °C, then resting for 5 seconds before the next pulse. The temperature at the topmost surface of the PEEK was monitored throughout the thermal pulses to determine the rate and extent of temperature rise, and those data points are illustrated in **FIGURE A.**

Result

While a gradual temperature increase occurred at the PEEK surface, the AZ-TPS maintained the temperature significantly below the applied thermal load, even after 10 cycles. For a 500 °C (932 °F) applied load, the maximum temperature reached after 10 cycles was only 221 °C (429 °F) for Type 1, while for a 300 °C (572 °F) load, the maximum temperature reached for Type 1 was only 137 °C (279 °F). The temperature was further reduced with Type 2 and Type 3 AZ-TPS.

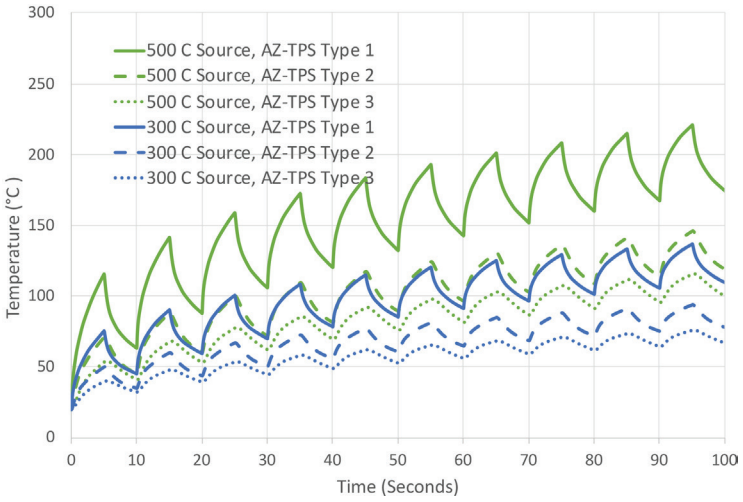

FIGURE A

Temperature as a function of time for PEEK substrate protected by AZ-TPS Types 1, 2, and 3 subjected to cyclic 300 °C and 500 °C pulse loads with 5 seconds recovery time between pulses.

Takeaways

During repeated heating/cooling thermal cycles, the AZ-TPS protective layer provides continuous thermal protection of the substrate. This performance equips Blueshift AZ-TPS to serve a valuable role in defense, aerospace, and electronics industries, as well as in such emerging technologies as eVTOL aircraft.

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Case Study: AZ-TPS Thermal Protection of Aluminum Under Constant 300 °C Heating

Application Profile

This application represents the insulation properties of Blueshift materials shielding a common aluminum surface. The infinitely thick aluminum substrate is protected by AZ-TPS consisting of one, two, or three layers of Blueshift AeroZero® material, each layer with a thickness of 165 microns. The AeroZero film(s) are bonded to each other with a 25-micron layer of silicone pressure sensitive adhesive (PSA), and also bonded to the aluminum with a 25-micron-thick layer of silicone PSA.

Methodology

While the sample was held at 20 °C, a 30-second thermal load of 300 °C (572 °F) was applied to the sample from a contact heat source. As shown in **FIGURE A,** when protected by AZ-TPS Type 1, a maximum temperature of 33 °C (91 °F) was reached at the PSA/Aluminum interface after 30 seconds of thermal exposure. Without the AZ- TPS present, the maximum temperature was 237 °C (458 °F)— ***a difference of 204 °C (367 °F)!***

Result

The structure with AZ-TPS exhibited a slower rate of heating, as well as a lower maximum temperature after the thermal load was applied. The temperature was further reduced with Type 2 and Type 3 AZ-TPS.

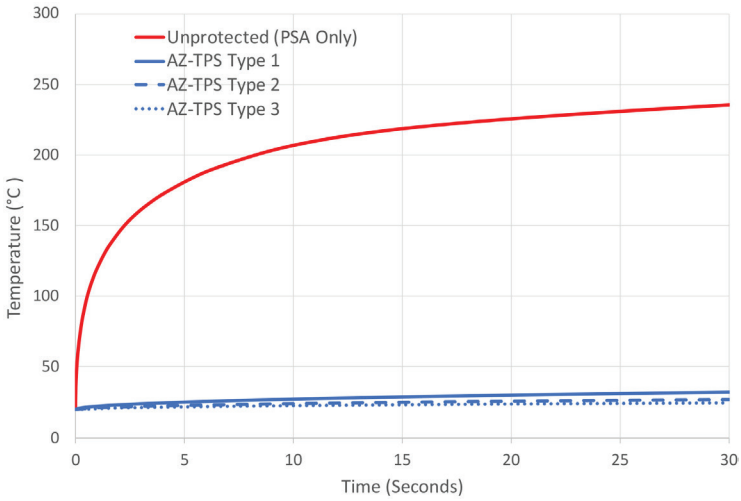

FIGURE A
Temperature as a function of time for aluminum substrate protected by AZ-TPS subjected to 300 °C constant thermal load.

Takeaways

Even on aluminum structures, AeroZero TPS technology provides a substantial level of thermal protection, providing significant new options for aerospace and defense engineers.

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