

Materials and Coatings

Creating Low Density Flexible Ablative Materials

[An Approach to Make Flexible Ablators that are Flexible Char Formers](#)

NASA has created a new approach to make a low density flexible ablative Thermal Protection Surface (TPS) material. The material is foldable and can be stowed in space for very long periods of time (years) without compromising deployability or performance. These flexible ablators offer an alternative to rigid TPS materials there by reducing design complexity associated with rigid TPS materials resulting in reduced TPS cost. The low density flexible ablator is unique in that the material retains its flexibility after charring. The charred material has similar flexibility and strength to the virgin material. This is in contrast too there flexible ablator concepts whereas stiffer chairs produced during heating.

BENEFITS

- Flexible ablators have significant design, system integration and performance advantages
- Allows for reduction in piece-parts
- Ease of assemble
- Enables larger diameter aero-shells
- Eliminates gap and seam issues (thermo-mechanical, aero-physics phenomena)

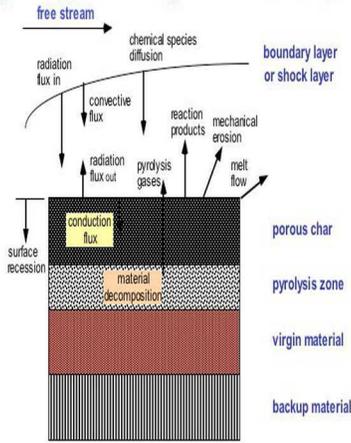
technology solution



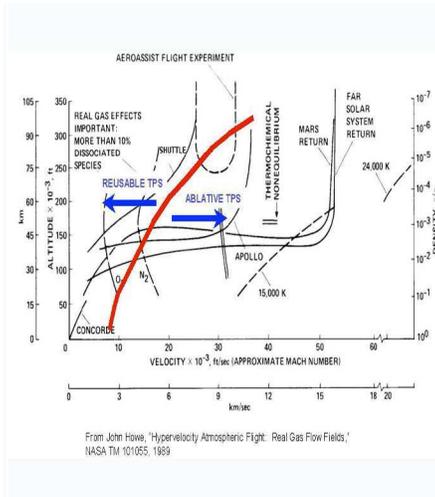
THE TECHNOLOGY

The low density flexible ablator can be deployed by mechanical mechanisms or by inflation and is comparable in performance to its rigid counterparts of the same density and composition. Recent testing in excess of 400W/cm² demonstrated that the TPS char has good structural integrity and retains similar flexibility to the virgin material, thereby eliminating potential failure due to fluttering and internal stress buildup as a result of pyrolysis and shrinkage of the system. These flexible ablators can operate at heating regimes where state of the art flexible TPS (non-ablative) will not survive. Flexible ablators enable and improve many missions including (1) hypersonic inflatable aerodynamic decelerators or other deployed concepts delivering large payload to Mars and (2) replacing rigid TPS materials there by reducing design complexity associated with rigid TPS materials resulting in reduced TPS costs.

Energy management through material consumption



What is Ablative TPS?



Why Ablative TPS?

APPLICATIONS

The technology has several potential applications:

- ➔ Aerospace Engineering
- ➔ Spacecraft
- ➔ Furnace refractory manufacturing
- ➔ Thermal Management

PUBLICATIONS

Patent Pending

