



## Energy Science Laboratories, Inc.

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# VEL-THERM™

## *Compliant Thermal Interface Materials*

(Interleaf gaskets, pads, and tapes)

**Description:** *Vel-Therm* thermal interface pads consist of numerous, vertically aligned, 7- $\mu$ m diameter, high thermal conductivity (high- $\kappa$ ) carbon fibers, forming a “velvet” structure that is soft and compliant.

**New concept:** Most thermal interface materials (including greases, adhesives, gaskets, pads, and tapes) consist of small, high- $\kappa$  particles embedded in a low- $\kappa$  matrix. The thermal conductivity  $\kappa$  of the resulting composite material is limited to values of the order of 1 W/m-K because of the high number of particle-matrix interfaces through the thickness. *Vel-Therm* gaskets have only two interfaces: one on each side of the gasket. The fibers span the gap, eliminating the resistive particle-matrix interfaces, allowing *Vel-Therm*  $\kappa$  values as high as 100 W/m-K.

In addition to having high  $\kappa$ , *Vel-Therm* makes intimate contact with interfacing surfaces because of its high compliance. Each fiber bends independently, allowing each fiber to make contact to both surfaces with low pressure, even when surfaces are not parallel, flat, or smooth. This results in high overall interface conductance.

**Advantages:** *Vel-Therm* is particularly effective for interfaces with one or more of the following characteristics:

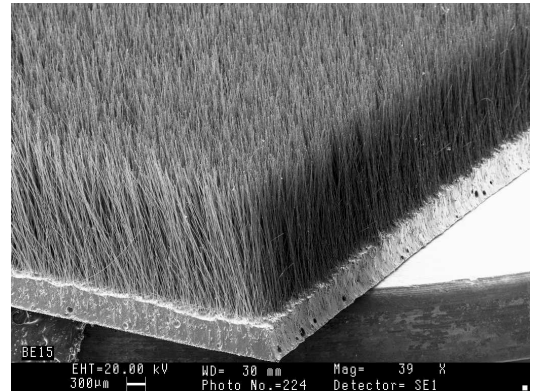
- Large gap between interfacing surfaces
- Non-flat surfaces
- Varying gap
- Thermal expansion or CTE mismatch
- High vacuum environment
- Low outgassing requirement
- Wide temperature range

**Configurations:**

- Single velvet: dry, wet, or bonded
- Double velvet
- Interleaf gasket

**Attachment methods:**

- Direct attach at ESLI
- Adhesive (e.g. thermal epoxy) or PSA (pressure sensitive adhesive film)
- Clamped in place with bolts, screws, or clamp



Contact ESLI for assistance in designing the best *Vel-Therm* product for your application.