

# ENrG<sup>®</sup> Inc. **Thin E-Strate<sup>®</sup>**

## Ultra-Thin, Flexible Ceramic Substrate Opens Path to Smaller, Lighter Products

### Solid State Devices:

- No outgassing in vacuum chamber
- Higher temperature film depositions
- High purity ceramic
- Moisture & gas impermeable
- Flexible for R2R processing
- Curved, thin design possibilities



*New twist on ceramics: 40µm thick Thin E-Strate<sup>®</sup>*

### Flexible Electronic Circuits:

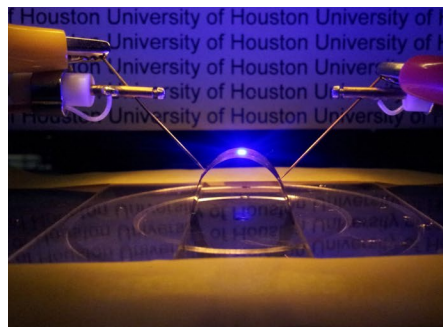
- Size, Weight & Performance (SWaP)
- Coatable with thin & thick films
- Vias, holes, slots & other features
- Thermal shock tolerant
- Dielectric material



*1 cm wide strip of Thin E-Strate<sup>®</sup> passing around process equipment rollers*

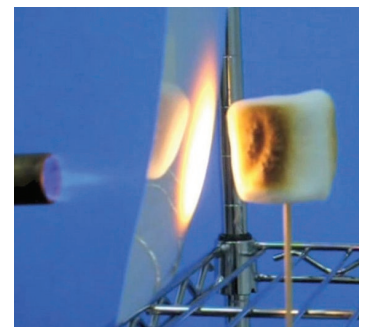
### Mounting of hot chips:

- LEDs and others
- Double-sided circuitry
- Chemical inertness
- Bendable for contoured shapes
- Translucent
- Low thermal resistance



*LED operating more efficiently and cooler on a flexed Thin E-Strate<sup>®</sup> substrate*

*Photo courtesy University of Houston*



*Marshmallow charred through Thin E-Strate<sup>®</sup> "window"*

**Contact:** Kathy Olenick — 716.873.2939 ext. 102 — kolenick@enrg-inc.com

155 Rano Street, Suite 300

Buffalo, NY 14207

Phone 716.873.2939

Fax 716.873.3196

www.enrg-inc.com

## Applications:

Thin film devices, portable electronics, solid state batteries, lightweight solar PV, durable labels, displays, sensors, protective cladding and bio-compatible devices.

Property		Measurement
<b>Physical:</b>	Material	3mol% Yttria-Stabilized Zirconia (3YSZ)
	Surface Roughness	20-25 nm
	Density	6.04 g/cm <sup>3</sup> , 99% dense
	Surface Energy	53.96 dyne/cm
<b>Mechanical:</b>	Bend Strength	1.2 GPa, measured on 2 cm strip, 20 microns
	Compressive Strength	2500 MPa @ RT
	Fracture Toughness	7.0 MPa x m <sup>1/2</sup>
	Tensile Strength	248 MPa @RT
<b>Thermal:</b>	Processing Temperature	≤ 1200°C up to 2 hrs.
	Operating Temperature	Up to 1000°C
	Bulk Thermal Conductivity	2.7 W/mK
	Coefficient of Thermal Expansion	8.2ppm @ RT, 10.7 ppm @ 1000°C
<b>Electrical:</b>	Dielectric Constant	28 @ 2.6 GHz
	Dielectric Strength	3200 VDC @ 40µm, 2500 VDC @ 20µm (R.T.)
	Df	0.0048 @ 2.6 GHz
<b>Optical:</b>	Light Dispersion	15% @ 40 microns
	IR Transparent	80% between 2-7 nm

## Thin E-Strate<sup>®</sup> Substrate Evaluation Kits Available for Purchase Online ([www.enrg-inc.com](http://www.enrg-inc.com)) In 40µm or 20µm Thickness

- 10-pack of 2.5cm diameter
- 5-pack of 4cm diameter
- 2-pack of 100mm diameter "wafer"
- 8-pack of 2cm x 4cm
- 6-pack of 2.7cm x 4.7cm
- 3-pack of 5cm x 5cm
- 2-pack of 10cm x 10cm

For shipments outside the U.S., please contact ENrG Inc. for a quote.



## Contact Us Regarding Your Custom Requirements

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