

# Innovations in Engineering Plastics & Composites for Solar Applications to Reduce Costs and Improve Performance

## Advantages of Engineering Plastics in the Solar Industry:

- Innovative engineering plastics offer cost reduction and product performance improvement opportunities. BASF helps the solar industry be more successful through ongoing research and innovations.
- A comparison of data for Ultramid® polyamide 6 and Ultradur thermoplastic polyester vs. typical metals used in solar applications are shown. Certain solar product design requirements, such as UL2703 and others used in commercial, industrial flat roof products are also shown. Ultramid® polyamide 6 and Ultradur thermoplastic polyester meet solar requirements.
- Specific examples of where the engineering plastics have been used are: in commercial flat roof mounting and single axis tracker bearing for ground mount utility installations.

## Performance Requirements for Solar: Metals vs. Engineering Plastics

Criteria	Aluminum and Galvanized Steel	Ultramid® 8233 GHS BK10 30% glass	Ultradur® B4040 G6 HR BK 15029 30% glass + HR
Tensile Strength -40°C to 95°C	++	+	+
Effect of Humidity	++	+	++
Heat Aging	++	+	+
Long Term UV Performance	++	++	++
Design Geometry Flexibility	+	++	++
Assembly Time on Roof	-	++	++
Corrosion Resistance	-	++	++
Stackable for Shipping	-	++	++
No Electrical Grounding with Frameless PV Modules	-	++	++
<b>Total Cost</b>	+	++	++

## Polymeric material performance requirements according to Underwriters Lab (UL) 2703\*

### UL 746C Ultraviolet Light Exposure

- 1000 hours of Xenon arc test or equivalent
- Average mechanical properties > 70% of original values

### UL 746C Water Exposure and Immersion

- 70 ± 2°C (158 ± 4°F) for 7 days
- Average mechanical properties > 50% of original values

### UL 2703 Section 7.4 Minimum Relative Temperature Index (RTI)

- Long term thermal aging at 95°C
- Average mechanical properties > 50% of original values

### Other Design Considerations

- UV Stability for 30 years in Arizona Outdoor Conditions

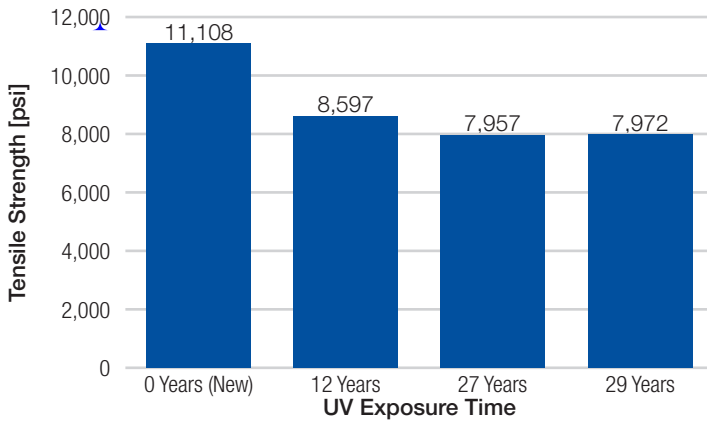
### Temperature and Humidity

- -40°C to 95°C
- Dry to 90% RH
- Wind Loading per ASCE up to 100 lbs./ft<sup>2</sup>
- Snow Loading per ASCE up to 55 lbs./ft<sup>2</sup>

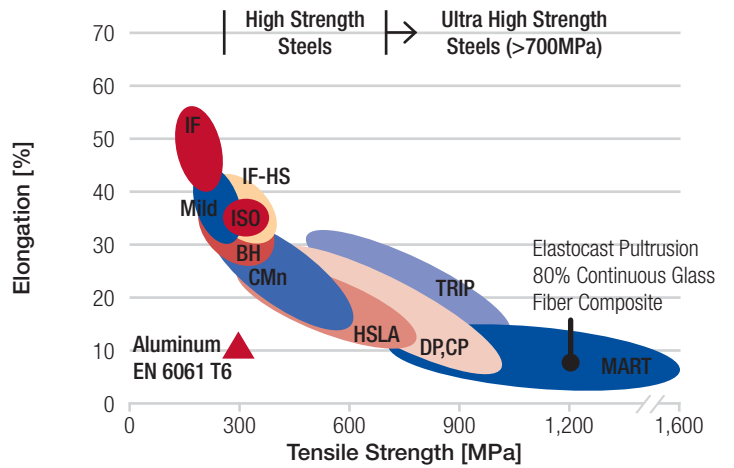
\*ANSI Approved: 01/28/2015



**BASF Ultramid® 8267 HS BK106  
Outdoor Weathering Performance**

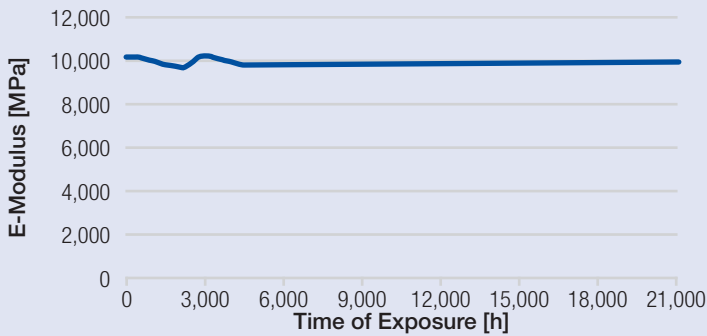


**Elastocast® Pultruded Polyurethane vs. Different Metals**

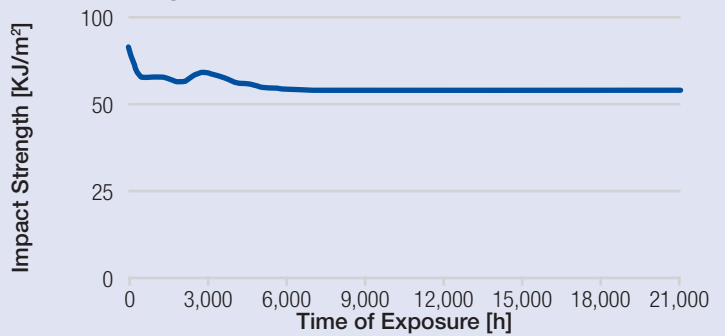


**UV-durability of Ultradur® B4040 G6 HR BK 15029 Xenon Arc 20 Years Simulation of Sunlight Exposure**

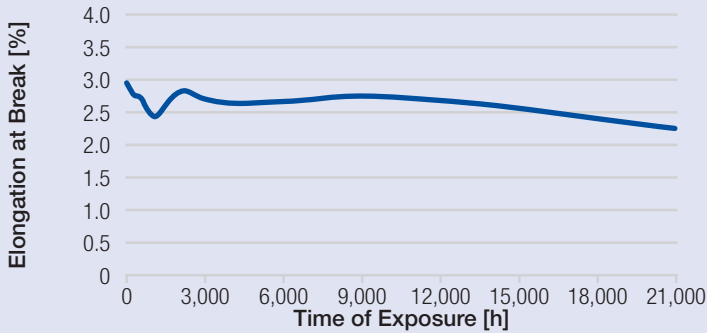
**E-Modulus**



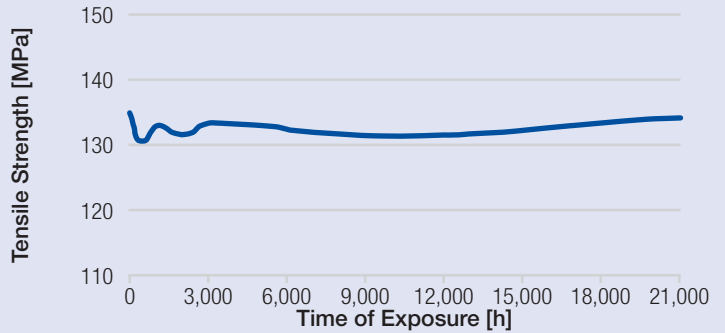
**Impact Strength**



**Elongation @ Break [%]**



**Tensile Strength**



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