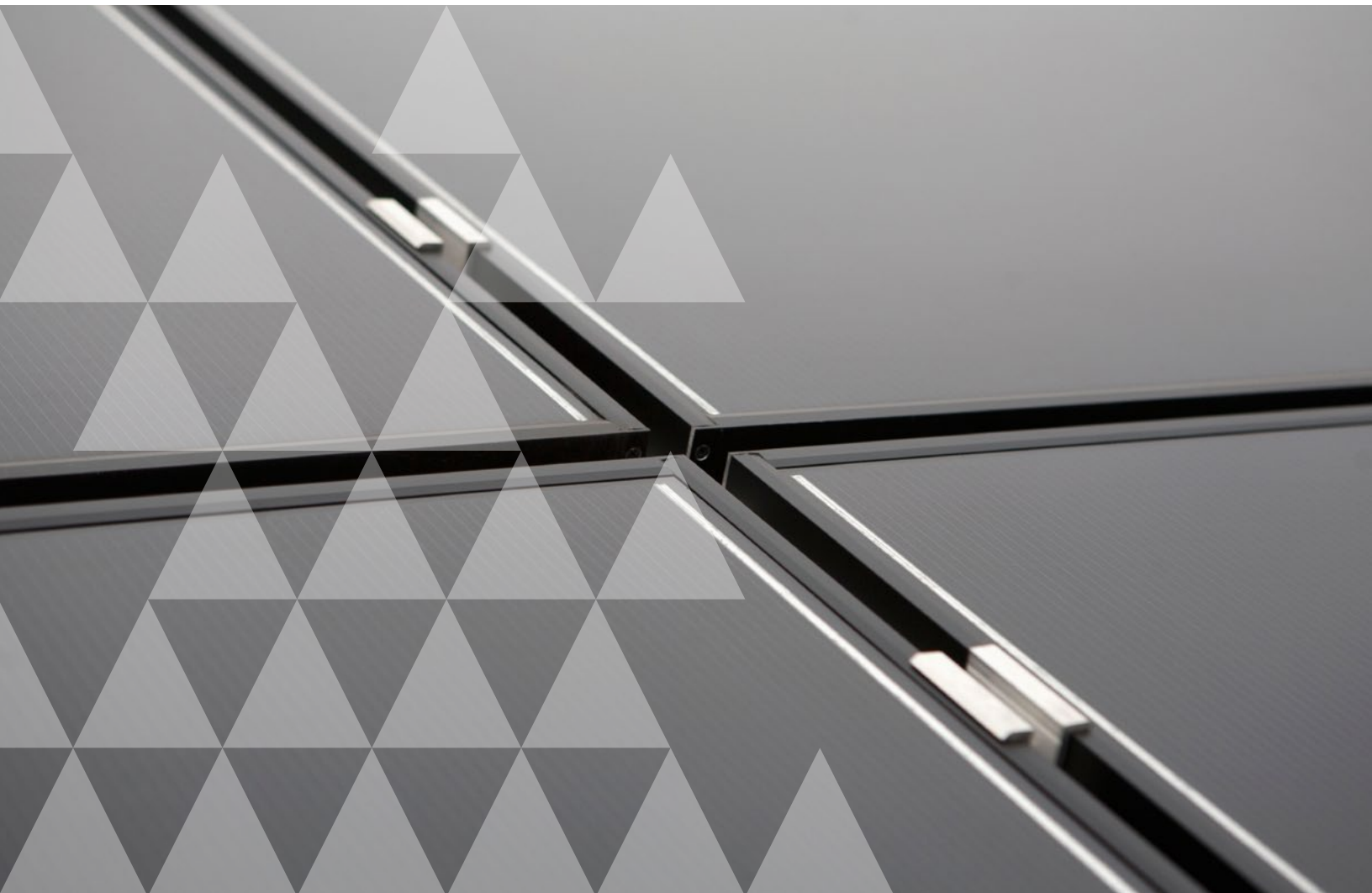




**MATERION**



**ADVANCED MATERIALS**

**ZAO (AZO)  
Rotatable  
Sputtering Targets  
for High Performance  
Al-doped Zn Oxide Coatings**

## ZAO (AZO) Rotatable Sputtering Targets for High Performance ZnAl-Oxide Coatings

Sputtering of Al-doped Zn oxide as dielectric, Ag-seed layer, or TCO from a ceramic target material has become widely accepted in the industry. Materion Advanced Materials, now expanded with the addition of the Heraeus target materials business, offers high quality, innovative ZAO rotatable targets that can significantly reduce production costs for our customers.

Our thermally sprayed ZAO rotatables increase target utilization thus saving raw materials costs. Due to their unparalleled sputter process stability, they enable highest homogeneity and enhanced layer properties of Al-doped Zn oxide coatings.

### RELIABLE AND HIGHEST QUALITY PRODUCTS

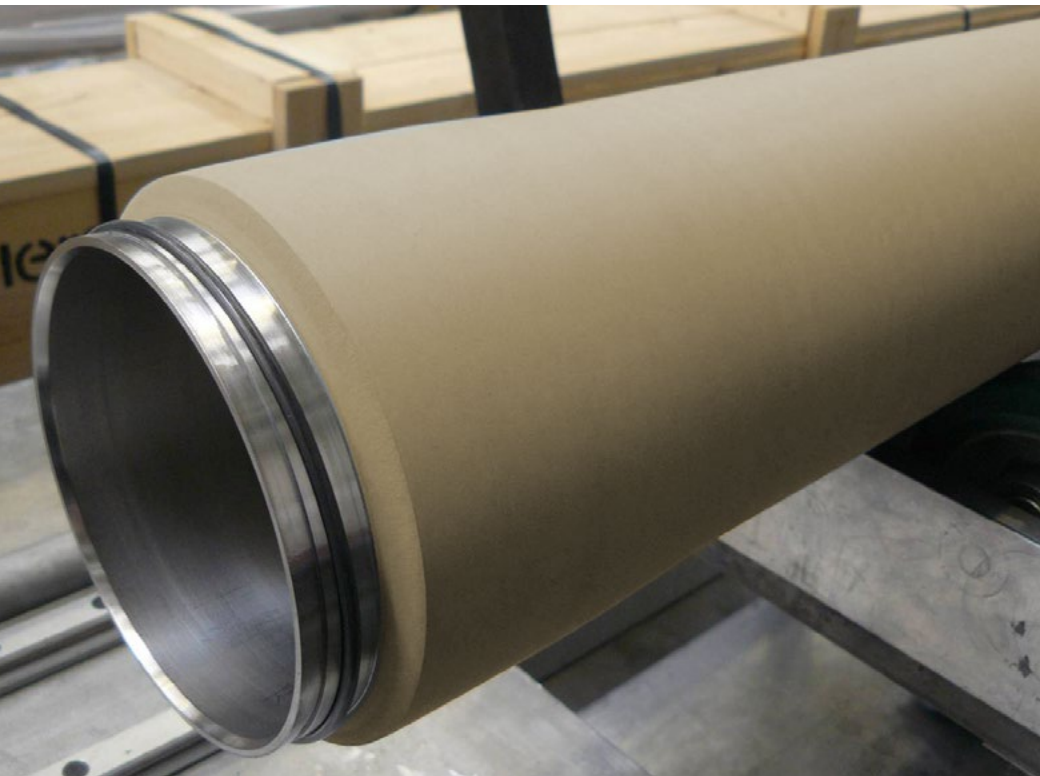
- State of the art production facilities
- Proven capabilities for process upscaling
- 30 years of experience in large area coating
- Highly integrated in-house manufacturing
- Targets qualified by system manufacturers
- All production and testing ISO 9001:2008 certified

### INNOVATIVE PRODUCTS

- Full range of R&D capabilities
- Targets optimized to your production requirements
- Close cooperation with system manufacturers

### CUSTOMER SUPPORT

- Extensive process technology
- Global network conveniently close



# Materion ... Materials to Advance the World's Technologies

| TECHNICAL DATA   |  |
|--|--|
| Application  | TCO/seed layer, front/back contact         |
| Production Method                                      | Thermal spray                              |
| Material   | ZnO/Al <sub>2</sub> O <sub>3</sub>         |
| Standard Composition (Al <sub>2</sub> O <sub>3</sub> ) | 1 wt% / 2 wt%                              |
| Purity   | 3N5  |
| Maximum Length   | 4 m  |
| Standard Thickness                                     | 8 mm, 10 mm, others on request             |
| Dogbone Configuration                                  | According to customer requirement          |
| Melting Point  | Sublimates at approx. 1800°C               |
| Thermal Conductivity                                   | Approx. 25 W/m*K                           |
| Thermal Expansion Coefficient                          | Approx. 5*10 <sup>-6</sup> K <sup>-1</sup> |
| Sputter Rate at 20 kW/m DC mode                        | 135 nm*m/min                               |
| Maximum Sputtering Power                               | 35 kW/m <sup>1)</sup>                      |
| Recommended Power Ramp Up                              | 0,6 kW/m* min                              |
| DC Mode  | Non pulsed/pulsed                          |
| Process Pressure                                       | Approx. 3*10 <sup>-3</sup> mbar            |
| Arcing Rate  | Almost not measurable                      |
| Typical Analysis Values                                | Cr, Co, Cu <10 ppm                         |
|  | Ca, Mg <50 ppm                             |
|  | Fe, Ni <20 ppm                             |
|  | Si <120 ppm                                |

1) Run with max cooling water flow, temp. of chamber increases at power densities ≥ 16kW/m

## BENEFITS

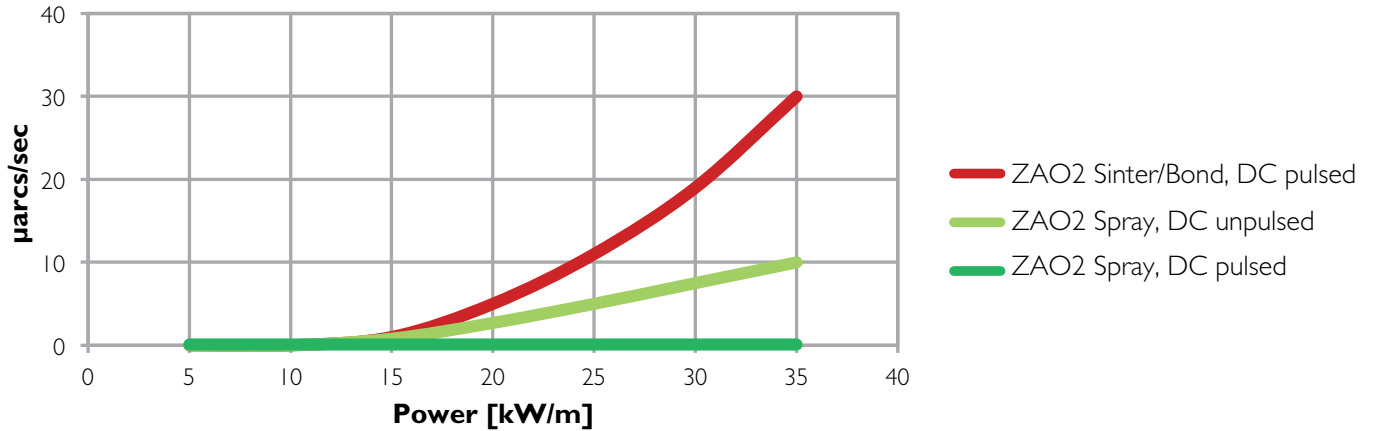
- Better sputter performance
  - No hard arcs
  - Almost no microarcing
- Greatly improved sputter yield up to 90%
- Reduced cost per kg
- No bonding gaps → strongly reduced arcing and no pollution issues out of gaps
- No risk of sleeves from mixed lots → improved film performance and homogeneity
- 100% homogeneous material reservoir improved layer uniformity and PV cell reliability & efficiency
- Increased deposition rate at cathode power levels > 20kW/m (DC mode)
- Customer specific target dimensions & dogbone configurations
- Highest sputtering power possible > 35 kW/m in DC mode, depending on ability of chamber cooling



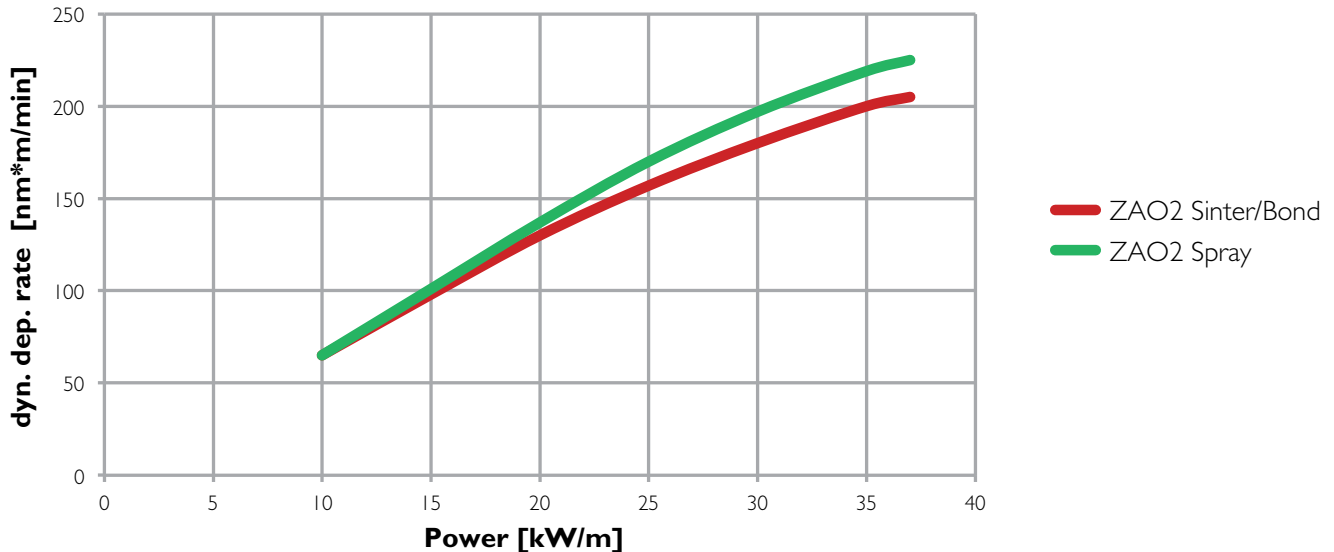
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# Sputtering Data for ZAO Rotatable

## Micro-Arcing of ZAO2 Rotatable Versions



## Dynamic Deposition Rate of ZAO2 Rotatable Versions



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### ADVANCED MATERIALS

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**MATERION CORPORATION**  
[www.materion.com](http://www.materion.com)

**MATERION ADVANCED MATERIALS**, now expanded with the addition of the Heraeus target materials business, is the world's leading supplier of sputtering targets for large area coatings. To achieve optimal results during the deposition process, sputtering targets must be capable of consistently producing uniform thin films. This requires the highest quality materials that meet or exceed industry standards. Our high purity sputtering targets are specifically developed to produce low defect and high performance thin films.