

THIN FILM MATERIALS FOR THE SOLAR ENERGY MARKET

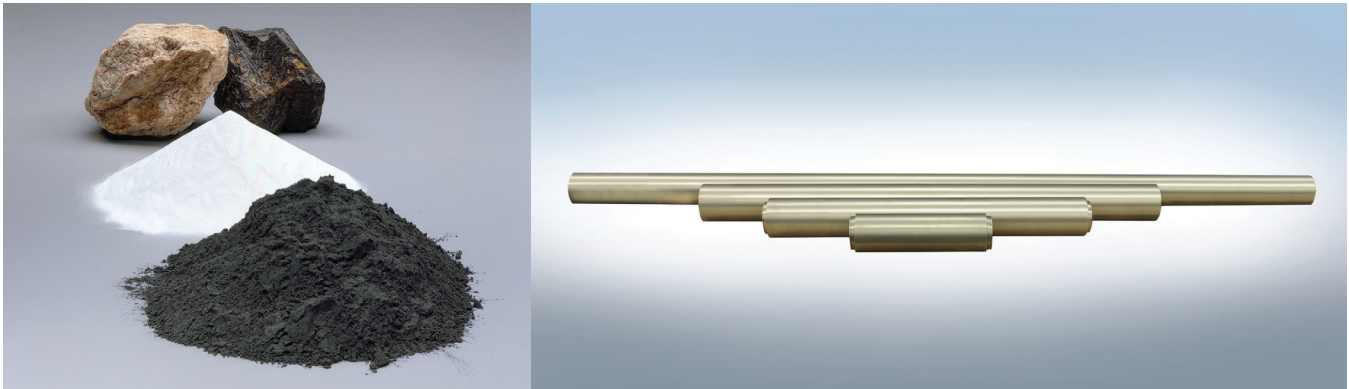


HIGH TECH MATERIALS FOR HIGH TECH APPLICATIONS

Elmet Technologies has decades of experience in the production of high performance materials that provide solutions to demanding solar applications.

- > Molybdenum > Niobium
- > Tungsten > Molybdenum alloys
- > Tantalum > Tungsten alloys
- > Titanium > Nickel alloys

Elmet Technologies is vertically integrated in the production of refractory metals from inorganic chemicals to finished products.



Refractory metals have special properties for thin film applications:

- > Conductive but not magnetic and are easily sputtered
- > Resistant to the harsh etchants used in device manufacturing
- > Adhesion to substrates and subsequent layers is generally good
- > Resistant to the diffusion of impurities
- > Coefficients of thermal expansion that are similar to silicon
- > low residual stress (at optimum sputter conditions)

VALUE-ADDED PRODUCT SOLUTIONS FOR THE SOLAR ENERGY MARKET

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| MATERIAL | POTENTIAL PV APPLICATIONS | TUBULAR | PLANAR |
|----------|---------------------------|---------|--------|
| Sheet | CIGS, CdTe, a-Si | ✓ | ✓ |
| Mo-Ti | Barrier Layer | ✓ | ✓ |
| W | Barrier Layer | ✓ | ✓ |
| WTi | Barrier Layer | ✓ | ✓ |
| NiV | CdTe, a-Si | ✓ | ✓ |
| Nb | Various | ✓ | ✓ |
| Ta | Barrier Layer | ✓ | ✓ |

* Coil availability depends on thickness

** Sheet availability depends on width and thickness



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