

**High Performance Metal Solutions** 

# High Performance DynaMo<sup>™</sup> Family of Sputtering Targets



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# DynaMo<sup>™</sup> Sputtering Target Material Properties

H.C. Starck Solutions offers flat rolled planar sputtering targets with the highest density in the industry.

#### **DynaMo<sup>™</sup> MECHANICAL PROPERTIES**

Density (g/cc)	10
Tensile	
YTS 0.2% (MPa (ksi))	380 (55)
UTS (MPa (ksi))	560 (81)
% @ break	2
Hardness (HVN 5 Kg)	200
CTE (ppm/°C)	TBD
Conductivity	
Thermal (W/mºK)	210-250
Electrical (μΩ-cm)	6.4

#### **TYPICAL MICROSTRUCTURES**



Longitudinal



DynaMo<sup>™</sup> sputtering targets were introduced to market for mobile FPD and TSD applications as a barrier layer and capping layer.

#### Why Use H.C. Starck's DynaMo<sup>™</sup>?

DynaMo<sup>™</sup> offers many benefits in etching and corrosion resistance.

#### > Etch Compatibility

- DynaMo<sup>™</sup> has the closest Etch rate to aluminum (Al) in PAN etchant compared to all molybdenum (Mo) alloys available in market
- DynaMo<sup>™</sup> can be easily etched with copper (Cu) etchant, producing clean profile with controlled taper angle

#### > Corrosion Resistance

 DynaMo<sup>™</sup> has 40-80% better Corrosion resistance in corrosive environments compared to molybdenumniobium (MoNb) and molybdenum-tantalum (MoTa)

#### > Black Material

- DynaMo-Ox<sup>™</sup> has Reflectivity less than 15%
- DynaMo-Ox<sup>™</sup> is Etch compatible with Al

Transverse

# DynaMo<sup>™</sup> offers the "BEST" Etching Solutions



#### **ETCH RATE IN PAN ETCHANT**

### DynaMo<sup>™</sup> Anti-Corrosion Properties

Corrosion rate comparison of Mo alloy at 85 °C, 85%H

#### GLASS (100 nm Mo alloy)



DynaMo-TSI<sup>™</sup> and DynaMo-TSR<sup>™</sup> are specifically designed for Touch Sensor and Automotive Display applications. These materials perform 40-80% better in corrosive environments than MoNb and MoTa.

# Black DynaMo<sup>™</sup> for Anti-Reflective Coatings

The DynaMo<sup>™</sup> family of sputtering targets can be employed to create Black Oxide for Anti-Reflective coatings.

H.C. Starck Solutions' patent pending solutions can be customized for each customer based on the customer's specific requirements and capabilities.

**Solution 1** – Lower Reflection by engineering the grain size and surface morphology

#### **Advantages:**

- > No need to change the sputtering target
- > No need to use reactive gasses during sputtering
- > Etch rate is not affected significantly
- > No need for high temperature post-processing

#### **Disadvantages:**

> At 550 nm, Reflectivity will be about 40-60% depending on the deposition parameters.

H.C. Starck Solutions' includes a very unique composition of DynaMo<sup>™</sup> that enables surface engineering of grain size and packing density, resulting to Reflection < 25-35%.





Increasing Ar pressure





Higher Ar pressure facilitates larger grain growth.



**Solution 2** – Lower Reflectivity by Reactive Sputtering

#### **Advantages:**

- > At 550 nm, Reflectivity < 10-15%
- > No need to change Target

#### **Disadvantages:**

> Using Reactive gasses during sputtering

H.C. Starck Solutions' patent pending DynaMo<sup>™</sup> composition and its oxide are designed for etchant (e.g. PAN) compatibly to ensure that etch rate is not significantly affected regardless of metallic or oxide format.







Solution 3 – Post annealing in air at Temperature of 350 °C

#### **Advantages:**

- > At 550 nm, Reflectivity < 0-10%
- > No need to change sputtering target
- > No need to use reactive gasses during sputtering
- > Etch rate is not affected significantly, since only the top surface is being affected

#### **Disadvantages:**

> Post-process annealing step at high Temperature

H.C. Starck Solutions' includes an annealing process at the 350 °C, which is similar to the curing step in FPD-TSP production setting.

#### GLASS (30 nm DynaMo<sup>™</sup>, 3000 nm Al and 30 nm DynaMo<sup>™</sup>)



Solution 4 – Lowering Reflectivity by Surface Modification: Anodization

#### **Advantages:**

- > At 550 nm, Reflectivity < 10-15%
- > No need to change the sputtering target
- No need to use reactive gasses during sputtering
- > Etch rate is not affected significantly, since only the top surface is being modified
- > Room temperature post-processing step

#### **Disadvantages:**

 Only certain material/composition react to anodization process

H.C. Starck Solutions' includes its patent pending anodization process for the DynaMo<sup>™</sup> family of products. DynaMo<sup>™</sup> would easily anodize using a low concentration of acidic/basic solution.



#### GLASS (200 nm DynaMo<sup>™</sup> and 3-5 nm Anodized DynaMo<sup>™</sup>)

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