



Pioneer Materials

Advanced Targets for photovoltaic • thermoelectric
• semiconductor • optical media • sensor applications

ESP-Cx
ESP-Dx

Phase Change Sputtering Targets

Pioneer Materials, Inc. (PMI) provides high density/low particle phase change targets for high performance CD-RW [4x, 10, 24x, and above] and re-writable DVD's [1x,2.4x, and above].

THE PMI ADVANTAGE

- Proprietary Powder Selection
- Consolidation Processes

Proprietary Manufacturing Process

Precise composition control and uniformity are the keys to achieve high performance of phase change targets for **optical recording**.

PMI has developed proprietary metrology methods to measure the target's composition.

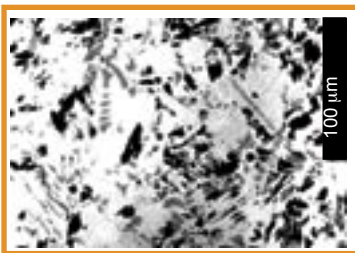
The resolution of the control is within +/-10% of customer specification.

Powder Preparation

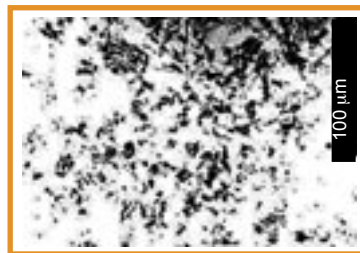
Start with finer powders than industry standards and use a proprietary powder blending process to achieve high uniformity.

Powder Consolidation

PMI has developed a proprietary process to achieve densities greater than 95% of theoretical, optimized for minimum stress, resulting in a finer more consistent microstructure.



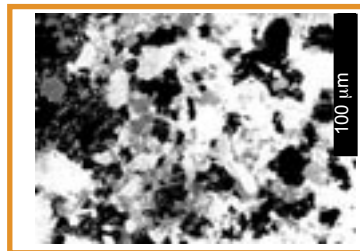
Current Conventional microstructure shows dendritic growth



PMI's microstructure is more consistent leading to lower particles



Current Conventional has dendritic growth resulting in less uniform microstructure



PMI microstructure Fine texture for a better sputter uniformity

THE PMI R&D CUSTOMER PARTNERSHIP PROGRAM

Pioneer Materials Inc. provides Excellent R&D Capabilities and Believes in Strong Customer Partnership. PMI will tailor the composition and dimension of targets for customer's specific needs.

In-House Capability

Density
Precision composition analysis
Powder blender
Hardness tester
Annealing furnace
Box annealing furnace
Induction melting furnaces

Customer Support Sites

Silicon Valley, California USA
Hsinchu, Taiwan
China



Materials Characterization

SEM
TEM
XPS
XRD
XRF
Chemical
Wet Analysis



THE PMI QUALITY ADVANTAGE

MANUFACTURING PROCESS	INSPECTION ITEM	INSPECTION FREQUENCY	INSPECTION METHOD
Raw Materials Inspection	Purity, Composition, Particle, Size, Weight	1/Lot	Certificate of Compliance
Target Sampling	Purity, Composition, Density, Inclusions, Microstructure	1/Lot	ICP & LECO analysis for purity Archimedes' techniques for density Microstructure analysis in Metallo-
Machining	Dimensions	All	Caliper
Final Inspection	Appearance	All	Visual
Cleaning	Dust	All	Visual
Packing	Vacuum	All	Pressure gauge
Shipping	Product name, lot number Amount, Packing list, Certificate of Compliance	All	

SAMPLE IMPURITIES ANALYSIS FOR TYPICAL PHASE CHANGE TARGETS

ppm

Elements	Level	Elements	Level	Elements	Level	Elements	Level	Elements	Level
Al	17	Cr	<0.1	K	3.4	Pb	2.7	Ti	1.2
As	0.5	Cu	2.5	La	<0.1	Pr	<0.1	Tm	<0.1
B	0.4	Dy	0.5	Li	0.3	S	1.3	U	<0.1
Ba	<0.1	Er	<0.1	Lu	<0.1	Sb	Matrix	V	<0.1
Bi	0.8	Eu	<0.1	Mg	0.3	Sc	<0.1	W	<5
Br	<0.2	F	<0.2	Mn	<0.1	Si	6.2	Y	<0.1
Ca	7	Fe	<0.2	Mo	<0.5	Sm	<0.1	Yb	<0.1
Cd	<0.1	Gd	<0.1	Na	71	Sn	<0.2	Zn	2.0
Ce	<0.1	Hf	<0.5	Nd	<0.1	Sr	<0.1	Zr	0.2
Cl	0.2	Ho	<0.1	Ni	15	Tb	<0.5	Te	Matrix
Co	<0.1	I	<1	P	<0.1	Th	<0.1	In	Matrix

COMPOSITION	Sb - Te - In - Ag - Ge - Sn - Cd Other composition upon request
PURITY	99.5% up to 99.995% (Depending on alloy type)
DENSITY	96% up to 100% Theoretical
SIZE	150 mm ~ 205 mm diameter by 4 mm ~ 11 mm thickness
TOLERANCE	Diameter: +/-0.25 mm Thickness: 0.13 mm
SURFACE FINISH	32 RMS (μ-in)