

Comparison of Common Sputtering Targets

The following table maybe useful in making decisions regarding your thin film deposition processes.

Column Two

Density

Maximal theoretical density of each PVD coating material

While density does not necessarily effect a sputtering rate, targets of higher density last longer and possess fewer voids or inclusions and, thus, deposit a better film.

Column Three

Yield

The number represents target atoms ejected from the target per argon ion striking the target with a kinetic energy of 600 ev (an energy level typical for an argon plasma). Magnetic field strength, gas composition and pressure, among other factors affect these yield numbers.

Column Four

Rate

These numbers reflect film deposition rates at maximum power density (i.e. about 250 w/in², with direct cooling) and a 4" source to substrate distance. Such rates decrease linearly with lower power levels. With all other factors unchanged, the film deposition rate will:

- Decrease by approximately 25% per inch beyond the 4" source to substrate distance.
- Increase by approximately 35% per inch closer than the 4" substrate distance.

The following sputtering yield rates are provided as a comparison. Specific thin film deposition rates will vary based upon PVD coating system design and process parameters.

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BARRIERS BECOME BREAKTHROUGHS

Ag 10.5 3.4 380 Al 2.7 1.2 170 Al ₉₈ Cu ₂ 2.82 170 Al ₂ O ₃ 3.96 40 Al ₉₉ Si ₁ 2.66 160 Au 19.31 2.8 320 Be 1.85 0.8 100 Bh 2.25 20 20 C 2.25 0.2 20 Co 8.9 1.4 190 Cr 7.2 1.3 180 Cu 8.92 2.3 320 Fe 7.86 1.3 180 Ge 5.35 1.2 160 Hf 13.31 0.8 110 In 7.3 800 In ₂ O ₃ 7.18 20	Target Material	Density (g/cc)	Yield @ 600 ev	Rate* (Å/sec)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Ag	10.5	3.4	380
Al_2O_3 3.96 40 $Al_{99}Si_1$ 2.66 160 Au 19.31 2.8 320 Be 1.85 0.8 100 B_4C 2.52 20 BN 2.25 0.2 20 C 2.25 1.3 180 C 2.3 320 E 7.86 1.3 180 C 7.86 1.2 160 10 <td< td=""><th>Al</th><td>2.7</td><td>1.2</td><td>170</td></td<>	Al	2.7	1.2	170
Al $_{99}$ Si $_1$ 2.66 160 Au 19.31 2.8 320 Be 1.85 0.8 100 B_4 C 2.52 20 BN 2.25 0.2 20 C 2.25 0.2 20 Co 8.9 1.4 190 Cr 7.2 1.3 180 Cu 8.92 2.3 320 Fe 7.86 1.3 180 Ge 5.35 1.2 160 Hf 13.31 0.8 110 In 7.3 800 In2O3 7.18 20 ITO 7.1 20	Al ₉₈ Cu ₂	2.82		170
Au 19.31 2.8 320 Be 1.85 0.8 100 B4C 2.52 20 BN 2.25 0.2 20 C 2.25 0.2 20 Co 8.9 1.4 190 Cr 7.2 1.3 180 Cu 8.92 2.3 320 Fe 7.86 1.3 180 Ge 5.35 1.2 160 Hf 13.31 0.8 110 In 7.3 800 In ₂ O ₃ 7.18 20 ITO 7.1 20	Al_2O_3	3.96		40
Be 1.85 0.8 100 B_4C 2.52 20 BN 2.25 0.2 20 C 2.25 0.2 20 Co 8.9 1.4 190 Cr 7.2 1.3 180 Cu 8.92 2.3 320 Fe 7.86 1.3 180 Ge 5.35 1.2 160 Hf 13.31 0.8 110 In 7.3 800 In ₂ O ₃ 7.18 20	$Al_{99}Si_1$	2.66		160
B_4C 2.52 20 BN 2.25 0.2 20 C 2.25 0.2 20 Co 8.9 1.4 190 Cr 7.2 1.3 180 Cu 8.92 2.3 320 Fe 7.86 1.3 180 Ge 5.35 1.2 160 Hf 13.31 0.8 110 In 7.3 800 In ₂ O ₃ 7.18 20 ITO 7.1 20	Au	19.31	2.8	320
BN 2.25 20 C 2.25 0.2 20 Co 8.9 1.4 190 Cr 7.2 1.3 180 Cu 8.92 2.3 320 Fe 7.86 1.3 180 Ge 5.35 1.2 160 Hf 13.31 0.8 110 In 7.3 800 In ₂ O ₃ 7.18 20 ITO 7.1 20	Be	1.85	0.8	100
C 2.25 0.2 20 Co 8.9 1.4 190 Cr 7.2 1.3 180 Cu 8.92 2.3 320 Fe 7.86 1.3 180 Ge 5.35 1.2 160 Hf 13.31 0.8 110 In 7.3 800 In ₂ O ₃ 7.18 20 ITO 7.1 20	B ₄ C	2.52		20
Co 8.9 1.4 190 Cr 7.2 1.3 180 Cu 8.92 2.3 320 Fe 7.86 1.3 180 Ge 5.35 1.2 160 Hf 13.31 0.8 110 In 7.3 800 In_2O_3 7.18 20 ITO 7.1 20	BN	2.25		20
Cr 7.2 1.3 180 Cu 8.92 2.3 320 Fe 7.86 1.3 180 Ge 5.35 1.2 160 Hf 13.31 0.8 110 In 7.3 800 In ₂ O ₃ 7.18 20 ITO 7.1 20	С	2.25	0.2	20
Cu 8.92 2.3 320 Fe 7.86 1.3 180 Ge 5.35 1.2 160 Hf 13.31 0.8 110 In 7.3 800 In ₂ O ₃ 7.18 20 ITO 7.1 20	Со	8.9	1.4	190
Fe 7.86 1.3 180 Ge 5.35 1.2 160 Hf 13.31 0.8 110 In 7.3 800 In ₂ O ₃ 7.18 20 ITO 7.1 20	Cr	7.2	1.3	180
Ge 5.35 1.2 160 Hf 13.31 0.8 110 In 7.3 800 In_2O_3 7.18 20 ITO 7.1 20	Cu	8.92	2.3	320
Hf 13.31 0.8 110 In 7.3 800 In_2O_3 7.18 20 ITO 7.1 20	Fe	7.86	1.3	180
In 7.3 800 In_2O_3 7.18 20 ITO 7.1 20	Ge	5.35	1.2	160
In ₂ O ₃ 7.18 20 ITO 7.1 20	Hf	13.31	0.8	110
ITO 7.1 20	In	7.3		800
	In_2O_3	7.18		20
	ITO	7.1		20
Ir 22.42 1.2 135	Ir	22.42	1.2	135

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BARRIERS BECOME BREAKTHROUGHS

Target Material	Density (g/cc)	Yield @ 600 ev	Rate* (Å/sec)
Mg	1.74	1.4	200
MgO	3.58		20
Mn	7.2	1.3	180
Мо	10.2	0.9	120
MoS ₂	4.8		40
MoSi ₂	6.31		110
Nb	8.57	0.6	80
Ni	8.9	1.5	190
Ni ₈₁ Fe ₁₉	8.8		110
Ni ₈₀ Cr ₂₀	8.5		140
$Ni_{93}V_7$	8.6		100
Os	22.48	0.9	120
Pd	12.02	2.4	270
Pt	21.45	1.6	205
Re	20.53	0.9	120
Rh	12.4	1.5	190
Ru	12.3	1.3	180
Si	2.33	0.5	80
SiC	3.22		50
SiO ₂	2.63		70
Si ₃ N ₄	3.44		40

DENTON VACUUM

BARRIERS BECOME BREAKTHROUGHS

Target Material	Density (g/cc)	Yield @ 600 ev	Rate* (Å/sec)
Sn	5.75		800
SnO	6.45		20
Ta	16.6	0.6	85
TaN	16.3		40
Ta ₂ O ₅	8.2		40
Th	11.7	0.7	85
Ti	4.5	0.6	80
TiN	5.22		40
TiO ₂	4.26		40
U	19.05	1	155
V	5.96	0.7	85
W	19.35	0.6	80
$W_{90}Ti_{10}$	14.6		80
WC	15.63		50
Υ	4.47	0.6	85
YBCO	5.41		10
Zn	7.14		340
ZnO	5.61		40
ZnS	3.98		10
Zr	6.49	0.7	85
ZrO ₂	5.6		40