

SALES BULLETIN

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DEPOSITION RATE CALCULATION METHOD FOR A ROTATING CIRCULAR TABLE SPUTTERING SYSTEM

In a multi-pass rotating table system, the average deposition rate is a function of the instantaneous rate and the substrate dwell time percentage per pass.

The instantaneous rate is the actual rate of deposition of material onto the substrate while it is under the target. The dwell time percentage is the ratio of the time the substrate is under the target to the time it takes for one complete revolution of the substrate table.

As an example, for a Delta Target:

A Delta target subtends an angle of 60° at the center of rotation, so the dwell time percentage is 16.7%.

For a particular material, the instantaneous rate may be 10,000 Å/min.

Average deposition rate then equals

$$\begin{aligned} & \text{Inst. Rate} \times \text{Dwell Time \%} \\ &= 10,000 \text{ Å/min.} \times 0.167 \\ &= 1,670 \text{ Å/min.} \end{aligned}$$

Specific rate is defined as average deposition rate per kilowatt of applied power, for a particular material. If the power was 10kW in the above example, the specific rate would be:

$$\begin{aligned} \text{Specific Rate} &= \frac{\text{Avg. Dep. Rate}}{\text{Pwr. (kW)}} \\ &= \frac{1,670 \text{ Å/min.}}{10 \text{ kW}} \\ &= 167 \text{ Å/kW-min.} \end{aligned}$$

From the specific rates given in the following table, deposition times can be determined for the desired thickness and for a given power level.

As an example, for 1 micron of aluminum deposited with an applied power of 9 kW from a Delta DC magnetron:

$$\text{Dep. Time} = \frac{10,000 \text{ Å}}{(200 \text{ Å/kW-min}) \times 9 \text{ kW}} = 5.56 \text{ min.}$$

| Material | Circular RF diode (8-inch) | Circular DC Planar Magnetron (8-inch) | Delta DC Magnetron | Single- Target RF Diode (21-inch) |
|--------------------------------|----------------------------------|--|-----------------------|--|
| Aluminum | 40 | 120 | 200 | * |
| Al ₂ O ₃ | 20 | + | + | 45 |
| Chromium | 35 | 110 | 180 | * |
| Copper | 75 | 200 | 320 | * |
| Gold | 90 | 240 | 400 | * |
| Molybdenum | 30 | 80 | 130 | * |
| Nichrome | 35 | 75 | 125 | * |
| Nickel | 40 | + | + | 85 |
| Platinum | 65 | 170 | 280 | * |
| Quartz | 30 | + | + | 65 |
| Silicon | 30 | + | + | 65 |
| Silver | 140 | 290 | 480 | * |
| Titanium | 30 | 110 | 180 | * |
| Ti-tungsten | 30 | 110 | 180 | * |

All values in Å/kW-min.
+Requires RF diode deposition
* Not recommended