Metallizer for BD-R/RE Production and Beyond

Oerlikon Systems

R. Bieri
Head of Metallizer
Balzers, March 2011
Layer Stack done on Oerlikon Metallizer
Oerlikon Metallizer: more than 20 Years in the OD Industry

<table>
<thead>
<tr>
<th>MO Disc</th>
<th>CD-RW,</th>
<th>DVD+/-RW, DVD-RAM,</th>
<th>BD-R/RE</th>
<th>BDXL</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDS 100</td>
<td>SDS 131</td>
<td>BIG SPRINTER</td>
<td>SPRINT-8</td>
<td>SPRINT-9/13</td>
</tr>
</tbody>
</table>

90 . . . . 93 . . . . 94 . . . . 95 . . . . 96 . . . . 97 . . . . 98 . . . . 99 . . . . 00 . . . . 01 . . . . 02 . . . . 03 . . . . 04 . . . . 05 . . . . .2011..

<table>
<thead>
<tr>
<th>CDI 901</th>
<th>CDI 915</th>
<th>SWIVEL98</th>
<th>TWISTER</th>
<th>CUBE SPEED &amp; SWIVEL2000</th>
<th>SWIVEL &amp; Cube Star &amp; CUBE LITE RF 2003</th>
</tr>
</thead>
</table>

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BD Recordable Media
Layers, the „Heart“ of the Recordable Disc

It’s all about the layers!
done on Oerlikon Metallizer
The right Metallizer for your Process
HtL, LtH, Pre-Recorded

“Sprinter” Metallizer

Recordable HtL (-R, -RE, -XL)

Swivel & Cube Star Metallizer

Pre-Recorded & Recordable LtH
Sprinter Family: The Industry Standard

Sprinter-5
BD-R

Sprinter-9
BD-R/RE

Sprinter-13
BD-RE, BDXL
The Complete Layer Stack in one System
The Complete Layer Stack in one System
Sprinter Advantages

**Speed:** Highest Throughput

**Uniformity:** Excellent Layer Uniformity

**Flexible Configuration:**
the right sputter source for your process
Sprinter Advantages: Speed

**Speed**: Highest Throughput
- Dry Cycle Time 2.8 sec
- > 1200 discs/h
- fast target change
- high uptime

**Uniformity**: Excellent Layer Uniformity

**Flexible Configuration**: the right sputter source for your process
Speed: “Indicat” for ARQ21 DC & RF and Disc Loader

Disc Loader

Dry Cycle Time:
Sprinter-5: < 2.8 sec
Sprinter-9: < 2.8 sec *
Sprinter-13: < 2.8 sec

(* incl. process time < 1.7 sec)

“Indicat” Indirect cooling plate

Fast Target Change Time < 30 sec

fixed cooling membrane
Sprinter Advantages: Uniformity

Speed: Highest Throughput
- Dry Cycle Time 2.8 sec
- > 1200 discs/h

**Uniformity:** Excellent Layer Uniformity
- < +/- 2.5 % for most sputter materials
- Disc rotation during sputtering
- Stable production condition

Flexible Configuration:
the right sputter source for your process
Uniformity: Layer Uniformity for your Process

Magnet system tuning to reach film thickness uniformity: \( \leq \pm 2.5 \% \) within a disc (for most sputter materials)
Sprinter Advantages: Flexibility for any Process

Speed: Highest Throughput
- Dry Cycle Time 2.8 sec
- > 1200 discs/h

Uniformity: Excellent Layer Uniformity
- < +/- 2.5 % for most sputter materials
- Disc rotation during sputtering

Flexible Configuration:
- DC, DC pulsed, DC Flexicat
- RF, RF Flexicat
- Cooling Station CS21
- MSQ Multi Source
Flexible Configuration: Process Station Selection

- Disc Loader
- ARQ21 DC
- ARQ21 RF
- ARQ21 RF Flexicat
- ARQ21 DC Flexicat
- MCIS
- Window
- MSQ
- CS21
- HS21
### Selected Sputter Rates for ARQ21DC and ARQ21RF

<table>
<thead>
<tr>
<th>ARQ21 DC</th>
<th>Al-alloy</th>
<th>≥ 33 nm/sec</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ag-alloy</td>
<td>≥ 33 nm/sec</td>
</tr>
<tr>
<td></td>
<td>TeGeSb</td>
<td>≥ 10 nm/sec</td>
</tr>
<tr>
<td></td>
<td>Cu-alloy</td>
<td>≥ 30 nm/sec</td>
</tr>
<tr>
<td></td>
<td>SiN</td>
<td>≥ 3 nm/sec</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ARQ21 RF</th>
<th>ZnS-SiO2</th>
<th>≥ 12 nm/sec</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GeCrN</td>
<td>≥ 2.5 nm/sec</td>
</tr>
<tr>
<td></td>
<td>GeN</td>
<td>≥ 2.5 nm/sec</td>
</tr>
</tbody>
</table>
MSQ (4 x ARQ81)

MSQ - Multi Source Quattro

- One to four DC/RF sputter cathodes in one process chamber
- Alloy sputtering (with individual power supply for each cathode)
- Serial sputtering to reduce investment costs (less process chambers and power supplies)
- Optimized geometry for superior radial composition uniformity when mixing different target materials
- Ideal for sputtering thin layers (<10nm)
- Ideal for low power sputtering
ARQ21RF & DC Flexicat Cathode
Movable Magnet Array for Uniformity Change
ARQ21RF & DC Flexicat Cathode

Mode a.) Layer Uniformity depending on magnet position

Thickness Uniformity (new Ag Target)

Radius [mm]

Thickness [nm]

0% 10% 20% 30% 40% 50%
ARQ21RF & DC Flexicat Cathode
Mode b.) Constant layer uniformity over target life

Less than 2% thickness uniformity over whole target life!
The right Metallizer for your Process
HtL, LtH, Pre-Recorded

“Sprinter” Metallizer
Recordable HtL (-R, -RE, -XL)

Swivel & Cube Star Metallizer
Pre-Recorded & Recordable LtH
Single Layer Sputter System Overview
Swivel, Cube Lite & Cube Star

Single & Dual Cathode Metallizer for:
- Aluminum
- Silver, Ag-Alloys
- Silicon
- Gold, CD-Gold
- Reactive Sputtering (SiN, etc)
- RF sputtering

SWIVEL & Cube Lite

CUBE STAR & CUBE STAR FLEX
Swivel & Cube Lite for DC & RF Sputtering
Single Cathode System

- Same base design for Swivel & Cube Lite
- Focus target cathode or flat target cathode
- Fixed or moving inner mask
- DC, DC reactive or RF sputtering
- Lowest running costs & smallest footprint
- Excellent service accessibility
- “Task oriented” touch screen panel, error tracking
- Large installed base
Cube Star
Dual Cathode System

- Flexible cathode and pivot arm configuration for DC and DC reactive sputtering
- Dual cathode design enables sputtering of very thick layers
- Flip Unit for front and back side metallization
- Smallest footprint, everything integrated
- “Task oriented” touch screen panel
- Error tracking / service support / analysis tool
- Large installed base
# The Right Cathode for every Material

**Swivel, Cube Lite, Cube Star**

<table>
<thead>
<tr>
<th>Cathode Name</th>
<th>Main Sputter Material</th>
<th>Application</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARQ 931S</td>
<td>Ag, Ag-Alloy, Al, Si, Au</td>
<td>DVD9 L1 &amp; L0, BD L0</td>
<td>Focus Target</td>
</tr>
<tr>
<td>ARQ931SiN</td>
<td>Si reactive for SiN</td>
<td>BD Backside Coating SiN</td>
<td>Focus Target</td>
</tr>
<tr>
<td>ARQ 950</td>
<td>Ag/Ag-Alloy</td>
<td>DVD R DL BD-ROM DL L1</td>
<td>Focus Target</td>
</tr>
<tr>
<td>ARQ 941</td>
<td>Conductive Material</td>
<td></td>
<td>Flat Target w/ center hole</td>
</tr>
<tr>
<td>ARQ 21</td>
<td>Conductive &amp; Dielectric Material</td>
<td>Barrier Layer BD-R LtH</td>
<td>Flat Target w/o center hole</td>
</tr>
</tbody>
</table>

- Highest flexibility
- Excellent uniformity
- Outstanding target utilization -> longest target life
- Fastest target changes
Swivel ARQ931: best Target Utilization

- Weight new target: 4.5 kg
- Weight used target: 2.1 kg
- Target utilization: > 52% (Silver)

= 1 mio shots @ 10nm
Wrap-Up: Metallizer for today's and tomorrows OD Media

“Sprinter”

Recordable Media (-R, -RE, -XL)

Swivel & Cube Star

Pre-Recorded & Recordable LtH
Thank you for your attention
Please visit us at booth A29
rudolf.bieri@oerlikon.com