Surface Technology & Materials Analysis
表面處理及材料分析

Materials Analysis
材料分析及測試

Surface Finishing
表面處理

Micro Fabrication & Sensors Technology
微型製造及傳感器技術

Technology Upgrade & Commercialization
技術升級與商品化

R&D Support
研發支援

HKPC®
Content

1. Background
2. High Power Pulsed Plasma Magnetron Sputtering Technique
3. Commercialization Package
4. Q & A
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High Power Pulsed Plasma Magnetron Sputtering Technique

- Provides Support and Consultancy Service to Industrial in High power Pulsed Magnetron Sputtering Technique.

- One-stop solution for client.

- Service from feasibility study, design, development, setup, experiment and production.
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Technology

**Existing traditional PVD coating problem**

- Arc evaporation method makes rough surface up to 0.5um coating thickness.
- The formation of large droplet.
- Exist residual stress.
- Can not deposit coating more than 2um thickness.
Technology

Advantage of High Power Pulsed Plasma Magnetron Sputtering Technique

- Relatively low plasma working process temperature.
- High ionization rate (> 90%).
- Target utilization is high, good sputtering uniformity.
- Can apply to complex substrate shape
- Based on the existing PVD machine for modification.
- Low friction coefficient
The characters of HPPMS

- High energy pulse sputtering
- Peak power (~ 1MV) is much larger than other sputtering
- (~ 5%) duty cycle less than conventional sputtering method
- High ionization rate (50-90%)
- Similar to the average general sputtering power and current
Technology

• 電源（Power supply）
  – 直流（DC）;
  – 中頻（Mid Frequency）;
  – 射頻（RF）;
  – 脈衝直流（pulsed DC）;
  – 脈衝（pulse）;

• 工藝（Process）
  – 非反應式磁控濺射；
  – 反應式磁控濺射（Reactive Sputtering）.
Technology

Energetic Deposition

Pulse Power

Magnetron Sputtering

HPPMS
高能量脉冲式磁控溅射

脈冲式磁控溅射系统示意图
Comparison of Conventional PVD (CMS) and HPPMS

### Technical Details

**CMS**
1. Low plasma density (~ 10^16 cm^3^)
2. Low ionization ratio (<0.1)
3. Mainly neutrals
4. It is difficult to control the electric field

**HPPMS**
1. High plasma density (~ 10^19 cm^3^)
2. High ionization ratio (0.5-0.7)
3. Metal ion-based
4. It is difficult to control the electric field
離化的過程
真空電鍍都是從第三和第四種型態進行鍍膜工藝
DLC layer thickness and composition

(FESEM & EDX)

<table>
<thead>
<tr>
<th>Thickness (µm)</th>
<th>Carbon-rich layer</th>
<th>Cr-rich layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLC sample</td>
<td>1.45</td>
<td>0.16</td>
</tr>
</tbody>
</table>

- C layer
- Ti layer

![Image of DLC layer thickness and composition](image-url)
Application Area

Application: Watch, Metal Mobile phone case, Tooling, Mould
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Commercialization Package

1. Turn-Key Consultancy Project Service
2. Upgrade Existing Equipment Service
3. Feasibility Study Service
Commercialization Package

1. Turn-Key Consultancy Project Service

- Sample & Process Trial
- Design and Fabricate High Power Pulse System
- Design Production line layout
- Installation of High Power Pulse System
- Offer Parameter and Operating Process
- Offer QC/Testing Method
- Offer Training
Commercialization Package

2. Upgrade Existing Equipment Service

- Sample & Process Trial
- Evaluate Existing Equipment
- Design High Power Pulse system for Existing Equipment
- Installation of High Power Pulse System
- Offer Parameter and Operating Process
- Offer QC/Testing Method
- Offer Training
Commercialization Package

3. Feasibility Study Service

- Sample & Process Trial
- Carry out QC/Testing
- Production Cost Reference
- Risk Assessment
- Investment Planning
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