**Features of MSE tester**

Material, surface, interface, sub-micron layer unit, strength, accurate measurement

### Objective
1. Hard coated thin film (DLC, TiN, CrN) single or multi layer, coating chip metal type surfaces
2. Rubber material, bulk film, functional rubber coating film
3. Metal (bulk, plate, heat process material) metallic wear resist metal part
4. Ceramic (sapphire, super-hard, diamond, CBN) sintered tool

### MSE data characteristic

1. **Film and substrate strength**
   - A measurement on material that using same substrate but contain a different coated film such as DLC and TiN has been conducted. The result shows a huge different in wear progression (slope from graph) on TiN and DLC coated film.

2. **Material strength distribution (depth direction)**
   - Easy understanding visual of material strength from plotted wear rate graph through depth direction.

3. **Wear rate (μm/g) vs Projected depth (μm)**
   - Wear rate : Low — High
   - Material strength: Stronger — Weaker

   The smaller wear rate shows the stronger material.

   Measurement result of DLC and TiN coated specimen

   View point from the graph

   - DLC more stronger compared to HSS.
   - Material strength: HSS < TiN < DLC
   - Thickness: 1.3 μm
   - Both HSS substrate posses the same strength.

4. **Interface layer strength**
   - With the detail plot focusing at interface layer, the change of strength can be visualized as smooth curve.

5. **Change of properties (substrate)**
   - There is a change of substrate properties possibility according to coating process (change of temperature, sputtering, ion dope). This change can be indentified as wear strength.

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**3 Film thickness**

A thickness of a material can be notice from the wear depth and projected particle amount plotted graph.

**DLC coated**

- The thickness of material is identified from the change of wear rate strength.
- As the MSE tester calculated wear rate from the graph slope, the graph is separated in 3 major parts that is, film, interfaces and substrate.

**Multi layer coated**

- As the MSE tester measuring material in sub-micro unit, it can be use for thickness identification for even ultrathin multi layer coated material.

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**Figures and Graphs**

- Wear rate (μm/g) vs Projected depth (μm) graph
- View point from the graph
- Projected particle amount (g) vs Wear depth (μm) graph
- View point from the graph
- Film wear strength vs Substrate properties transformation area graph
- View point from the graph

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**References**

- Palmas Co., Ltd.

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**Contact for more information please visit our website**

http://www.palmas.co.jp
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MSE tester defined this slope as the wear rate.

![Wear rate graph](image)

Measurement result of DLC and TiN coated specimen

2. Material strength distribution (depth direction)

Easy-understanding visual of material strength from plotted wear rate graph through depth direction.

![Wear depth graph](image)

3. Film thickness

A thickness of a material can be notice from the wear depth and projected particle amount plotted graph.

- **DLC coated**
  - The thickness of material is identified from the change of wear rate strength.
  - As the MSE tester calculated wear rate from the graph slope, the graph is separated in 3 major parts that is, film, interfaces and substrate.

![DLC coated graph](image)

- **Multi layer coated**
  - As the MSE tester measuring material in sub-micro unit, it can be use for thickness identification for even ultrathin multi layer coated material.

![Multi layer coated graph](image)

4. Interface layer strength

With the detail plot focusing at interface layer, the change of strength can be visualized as smooth curve.

![Interface layer graph](image)

5. Change of properties (substrate)

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![Substrate properties graph](image)