

# Coating Characterization

### Performance testing:

Coating performance testing evaluates a coating's quality, durability, and protective properties through standardized methods like adhesion, hardness, corrosion, and weather resistance tests. These tests assess physical and chemical resistance to ensure the coating meets required standards for longevity, proper application, and specific environmental conditions. Testing categories include **laboratory simulations**, **outdoor exposure**, and **empirical quality control** tests, often following ASTM or other industrial guidelines.

#### Liquid coating performance testing

| Testing items            | Description          | ISO standard                | ASTM standard                                                          | China GB standard                                   | Internal methods |
|--------------------------|----------------------|-----------------------------|------------------------------------------------------------------------|-----------------------------------------------------|------------------|
| Flow time & Viscosity    | Flow time            | ISO 2431-ISO cups           | ASTM D5125 ISO cups,<br>ASTM D4212 Zahn cups,<br>ASTM D1200 Ford cups, | GBT 6753.4-ISO cups,<br>GBT 1723 Tu-1 & 4 cups      |                  |
|                          | Rotary Viscosity     | ISO 2884-1                  |                                                                        | GBT 9751.1                                          |                  |
|                          | Stormer viscosity    |                             | ASTM D562                                                              | GBT 9269                                            |                  |
| Fineness & Particle size | Fineness             | ISO 1524                    | ASTM D 1210                                                            | GBT 1724                                            |                  |
|                          | Particle size        | ISO 8130-13                 |                                                                        | GBT 21782.13                                        |                  |
| Non-volatile content     | Non-volatile content | ISO 3251<br>ISO 3233-volume | ASTM D 2369                                                            | GBT 1725<br>GBT 9272-volume,<br>GBT 6751<br>GBT6740 |                  |
| VOC content              | VOC content          |                             | EPA method 24                                                          | GBT 23985-weight<br>GBT 23986-GC                    |                  |
| Density                  | Density              | ISO 2811                    | ASTM D1475                                                             | GBT 6750<br>GBT 21862                               |                  |
| Stability                | Stability            |                             | ASTM D 2243                                                            | GBT 6753.3<br>GBT 9268                              |                  |

#### Dried coating film performance testing

| Testing items                   | Description                       | ISO standard           | ASTM standard          | China GB standard | Internal methods                                  |
|---------------------------------|-----------------------------------|------------------------|------------------------|-------------------|---------------------------------------------------|
| Thickness                       | Electromagnetism                  | ISO 2808               | ASTM D7091             | GBT 13452.2       |                                                   |
|                                 | Ultrasonic                        | ISO 2808               | ASTM D6132             | GBT 13452.2       |                                                   |
|                                 | Optic interference & polarization |                        |                        |                   | Optical reflection & interference<br>Ellipsometer |
|                                 | Destructive testing               | ISO 2808               | ASTM D4138             | GBT 13452.2       |                                                   |
| Adhesion                        | Adhesion-Cross cut                | ISO 2409               | ASTM D3359             | GBT 9286          |                                                   |
|                                 | Adhesion Pull-off                 | ISO 4624               | ASTM D4541             | GBT 5210          |                                                   |
| Hardness                        | Pencil hardness                   | ISO 15184              | ASTM D3363             | GBT 6739          |                                                   |
| Optical properties              | Gloss                             | ISO 2813               | ASTM D523<br>ASTM 2457 | GBT 9754          |                                                   |
|                                 | Transmittance & Haze              | ISO 14782<br>ISO 13468 | ASTM D1003             | GBT 2410          |                                                   |
|                                 | Color                             | ISO 7724               | ASTM D2244             | GBT 11186         |                                                   |
| Flexibility                     | Cylindrical mandrel               | ISO 1519               | ASTM D 522             | GBT 6742          |                                                   |
|                                 | Conical mandrel                   | ISO 6860               | ASTM D 522             | GBT 11185         |                                                   |
|                                 | T-bend                            | ISO 17132              | ASTM D4145             | GBT 30791         |                                                   |
|                                 | Cupping test                      | ISO 1520               |                        | GBT 9753          |                                                   |
|                                 | Impact resistance                 | ISO 6272               | ASTM D2794             | GBT 20624         |                                                   |
| Abrasion and Scratch resistance | Abrasion resistance               | ISO 7784               | ASTM D 4060            | GBT 1768-2006     |                                                   |
|                                 | Scratch resistance                | ISO 1518               |                        | GBT 9279          |                                                   |
| Aging test                      | Neutral SST                       | ISO 7253               | ASTM B117              | GBT 1771          |                                                   |

|                     |                        |                                                              |                          |                                                             |  |
|---------------------|------------------------|--------------------------------------------------------------|--------------------------|-------------------------------------------------------------|--|
|                     | SST test               | ISO 9227                                                     |                          | GBT 10125                                                   |  |
|                     | Accelerated aging test | ISO 11341 Xenon arc radiation<br>ISO 11507 UV lamp and water |                          | GBT 1865 Xenon arc radiation<br>GBT 23987 UV lamp and water |  |
| Barrier properties  | WVTR                   | ISO 15106-2                                                  | ASTM F1249               | GBT 26253                                                   |  |
|                     | OTR                    | ISO 15105-2                                                  | ASTM D3985               | GBT 19789                                                   |  |
| Non-stick coating   |                        |                                                              |                          | GBT 32095.1 ~ .4                                            |  |
|                     |                        |                                                              |                          |                                                             |  |
| Surface properties  | Contact angle          |                                                              |                          | GBT 30693<br>GBT 30447                                      |  |
| Chemical resistance | Chemical resistance    |                                                              | ASTM D5402<br>ASTM D4752 | GBT 30648.1~.2<br>GBT 23989<br>GBT 1763<br>GBT 9274         |  |

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### ASTM D3359 (Adhesion By Cross-Cut)

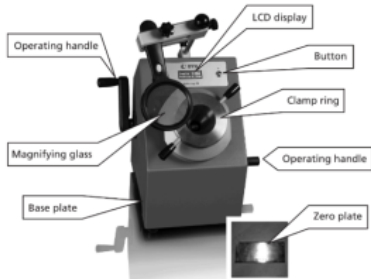
| Example Appearance |                 | Description                                                                                                                                                                                                                              | Classification |      |
|--------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------|
| Minimum Removal    | Maximum Removal |                                                                                                                                                                                                                                          | ISO/US         | ASTM |
|                    |                 | The edges of the cuts are completely smooth; none of the squares of the lattice is detached.                                                                                                                                             | 0              | 5B   |
|                    |                 | Detachment of flakes of the coating at the intersections of the cuts. A cross cut area not greater than 5% is affected.                                                                                                                  | 1              | 4B   |
|                    |                 | The coating has flaked along the edges and/or at the intersections of the cuts. A cross cut area greater than 5%, but not greater than 15% is affected.                                                                                  | 2              | 3B   |
|                    |                 | The coating has flaked along the edges of the cuts partly or wholly in large ribbons, and/or it has flaked partly or wholly on different parts of the squares. A cross cut area greater than 15%, but not greater than 35%, is affected. | 3              | 2B   |
|                    |                 | The coating has flaked along the edges of the cuts in large ribbons and/or some squares have detached partly or wholly. A cross cut area greater than 35%, but not greater than 65%, is affected.                                        | 4              | 1B   |
|                    |                 | Any degree of flaking that cannot be classified even by classification 4 or 1B                                                                                                                                                           | 5              | 0B   |



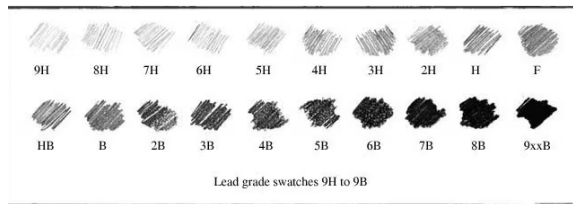
### ADL Coating Competency - Adhesion



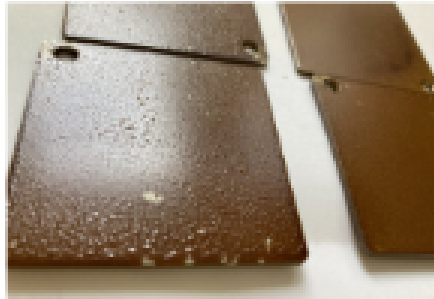
### ISO 6860 (Conical Mandrel Test)



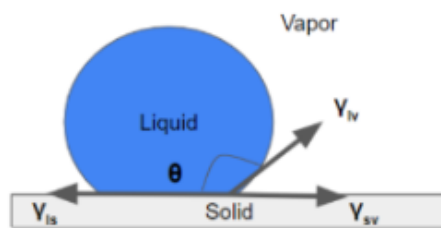
### ISO 1520 (Erichsen Cupping Test)



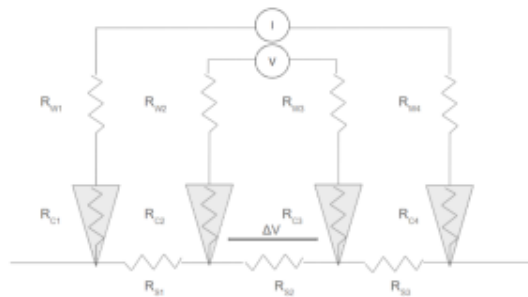
ASTM D3363 (Pencil Hardness)



ASTM D714-02 (Blistering Test)



Contact Angle



Electrical Conductivity



Non-Stick Coatings

ATLAS Test (Under Construction)

Coating Chemical Resistance (Under Construction)