Thermal Spray Coating (Ceramic Coating)

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Discover the Truth of Material

Purpose:

Observe the microstructure of thermal spray coatings. Thermal spraying is a tech-nique that uses high-energy heat sources (e.g., flame, plasma, or electric arc) to heat spray materials (ultrafine powders, wires, or rods of metals, non-metals, or ceramics) to a molten state. The atomized particles are accelerated to high velocities and sprayed onto a substrate to form functional surface coatings. Metallographic testing evaluates the coating-substrate interface, coating microstructure, porosity, cracks, and particle melting. Samples undergo cutting (TableCut200), mounting (TJ2568 cold-curing resin), grinding/polishing (Alpha610), and microscopic examination (MN80 metallographic microscope).

Recommended parameters for different specimen size				
Sample size/ diameter (mm)	25	30	40	50
Individual force loading mode, individual sample pressure force (N)	-5	0	+(5~10)	+(5~10)

*Standard pressure: ϕ30mm (adjust according to sample size).

Recommended Equipment and Consumables(select grinding/ polishing consumables based on sample conditions)



TableCUT-200 manual/automated precision cutting machine

Cutting

Equipment	TableCUT-200 manual/automated precision cutting machine	
Cutting disc	DR resin bond diamond cutting disc	Order No: 01.04.656
Cutting coolant	TJ 1410 metallographic cutting coolant	Order No: 01.07.857
Fixture	Horizontal push fixture	
Cutting method	Horizontal cutting (Y-axis)	
Cutting Parameters	Feed rate	0.1mm/s
	Pulse setting	Pulse cutting
	Speed of cutting disc	2500rpm
Note	Pay attention to the cutting direction so that the coating bears the pressure.	

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ThetaMount pressure cold mounting machine

Cold Mounting

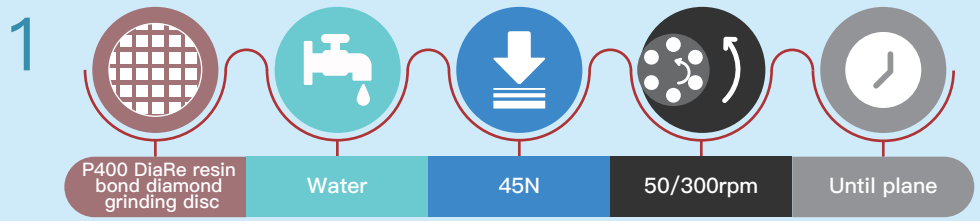
Equipment	ThetaMount pressure cold mounting machine	
Cold mounting resin	TJ 2568 epoxy resin	A：Order No：02.04.855
		B：Order No：02.04.856
Mix ratio	A：B=4.5:1	
Curing time	45–90min	

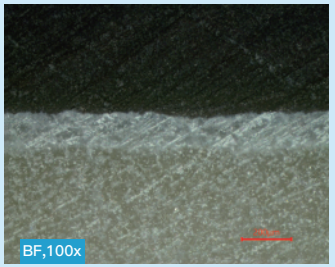
Basic Guide

- **Cutting**
  1.Use resin–bonded alumina cutting wheels for metallic coatings or diamond cutting wheels for ceramic coatings. Refer to the Trojan Cutting Guide for specific models.
  2.Select pulse mode for cutting, with a recommended maximum cutting speed ≤0.25 mm/s.
- **Mounting**
  Use high–edge–retention cold–curing epoxy resin with the pressure cold–mounting equipment.
- **Grinding**
  1.Begin with P400 diamond grinding discs until the sample surface is flat and cutting damage is fully removed.
  2.Continue fine grinding with a POH disc + 9 μm diamond polishing suspension.
  3.Clean the sample, sample holder, and hands after each grinding step.
- **Polishing**
  1.Clean the polishing cloth, sample holder, and hands before polishing. Repeat cleaning after each step.
  2.Do not mix polishing disks with different abrasive particle sizes.
  3.Rinse the sample surface with alcohol and dry with a blower to remove residue.
  4.After each polishing step, inspect under a metallographic microscope to ensure scratch size matches the abrasive grit and direction is random.
  5.Clean polishing cloths with running water and a soft brush after use, then air–dry.
  6.Dedicate polishing cloths used for thermal spray coatings exclusively to such samples.
  7.After using silica polishing suspension, clean the bottle cap thoroughly before sealing.

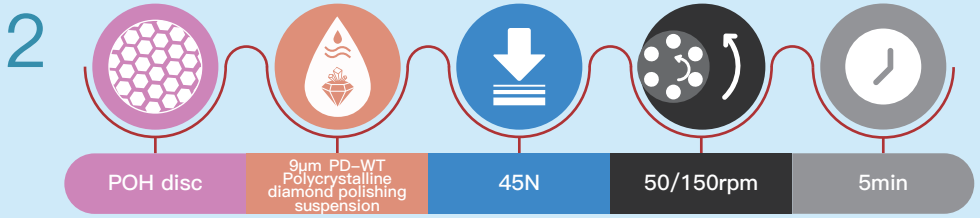
Preparation Procedure——Thermal Spray Coating (Ceramic Coating)

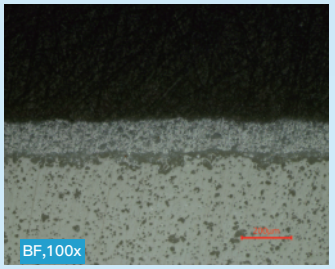
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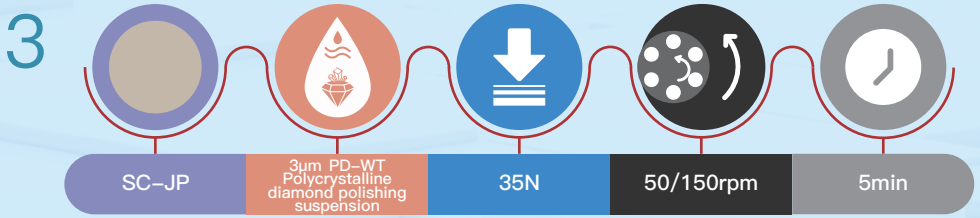


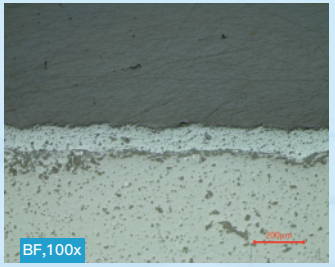


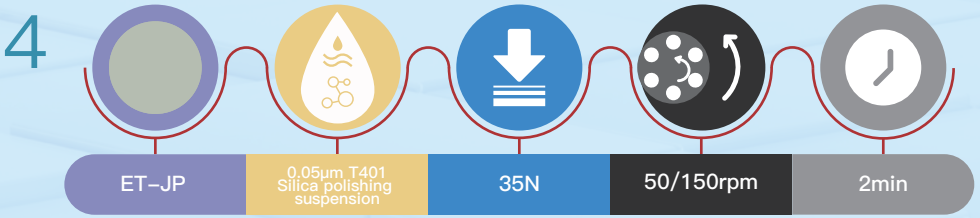
Time and pressure parameters apply to standard 250 mm diamond grinding discs/polishing cloths and 30 mm diameter samples.

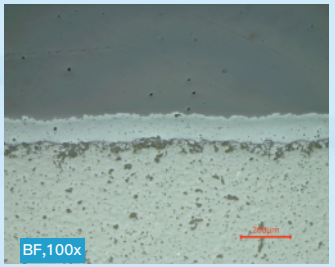








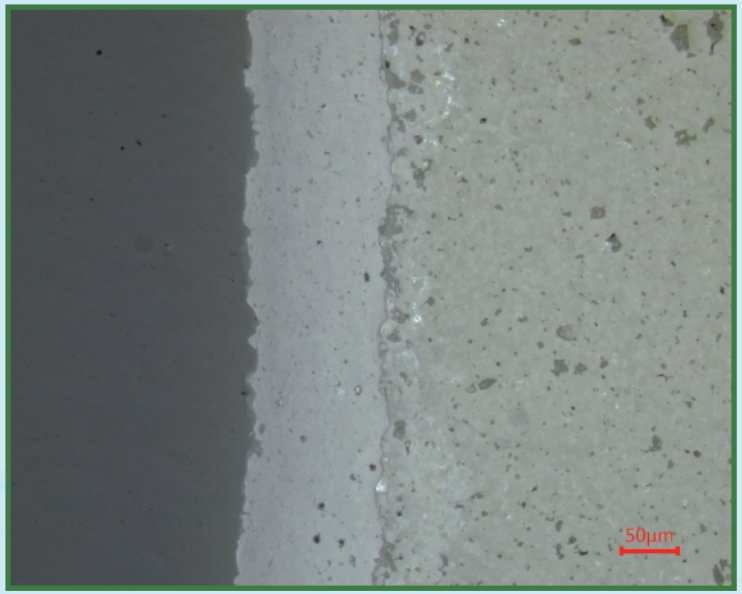




Thermal Spray Coating (Ceramic Coating)-Polishing Defect Sample

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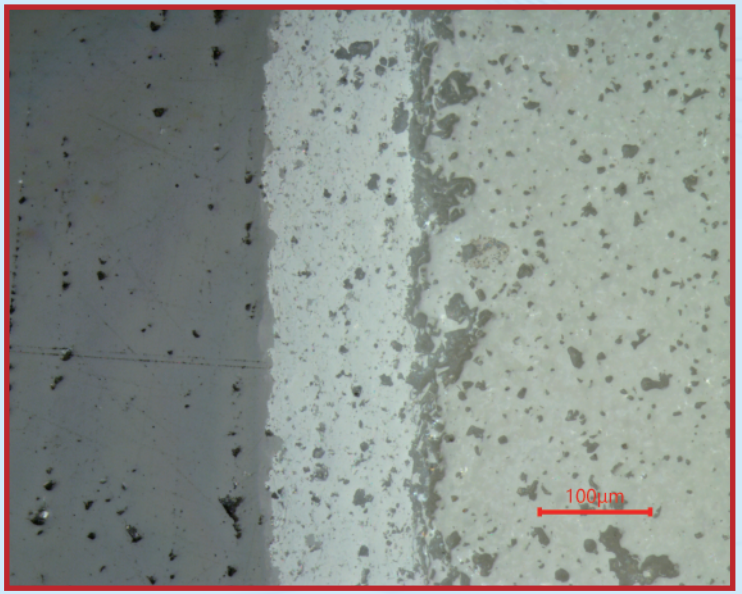
Photos of qualified polished samples



Micrograph after ET–JP cloth + 0.05 μm T401 silica polishing suspension (200X magnification)

- Cohesive layer fully removed; coating and substrate surfaces are flat with no steps or scratches;
- The surface of the sample is clean and free of stains.

Photos of unqualified polished samples



Micrograph after ET–JP cloth + 0.05 μm T401 silica polishing suspension (200X magnification)

- Incomplete removal of the cohesive layer;
- Extend polishing time with SC (coarse polishing) and ET (intermediate polishing) cloths until the layer is fully removed.