Thermally Spray Coated Specimens



THERMALLY-SPRAY COATED SPECIMENS

Thermally sprayed coatings (TSC) and thermal barrier coatings (TBC) are widely used on many metal substrates. Invariably, these coatings are not 100% dense but contain several types of voids, such as porosity and linear detachments. Hot compression mounting is not recommended as the molding pressure can collapse the voids. Use a low-viscosity castable epoxy and use vacuum infiltration to fill the connected voids with epoxy. Fluorescent dyes may be added to the epoxy. When viewed with fluorescent illumination, the epoxy-filled voids

Table 30: 4-Step Method for TSC and TRC Specimens with Metallic Coatings

appear bright yellow-green. This makes it easy to discriminate between dark holes and dark oxides, as would be seen with bright field illumination. Filling the pores with epoxy also makes it easier to keep the pore walls flat to the edge during preparation. Aside from this mounting requirement, TSC and TBC specimens are prepared using all of the factors needed for good edge retention (see pages 14-17). A variety of procedures can be used. The Apex Hercules H rigid grinding disc produces exceptional edge flatness for these specimens. Two four step procedures for TSC and TBC specimens using the Apex Hercules H rigid grinding disc for specimens with metallic coatings and one procedure

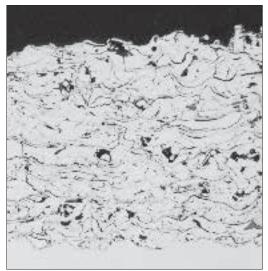
Sectioning	Precision Saw with 15HC blade recommend for thermal spray coatings						
Mounting	Castable, typically with epoxy drawn under vacuum						
Surface	Abrasive / Size	Load - Ibs [N] / Specimen	Base Speed [rpm]	Relative Rotation	Time [min:sec		
Apex Color Yellow	35µm Diamond water cooled	6 [27]	300		Until Plane		
Apex Hercules S Rigid Grinding Disc	9µm MetaDi Supreme Diamond*	6 [27]	150		4:00		
TriDent	3µm MetaDi Supreme Diamond*	6 [27]	150		3:00		
ChemoMet	0.02 - 0.06µm MasterMet Colloidal Silica	4 [18]	150		2:00		
= Platen	= Specimen Holder *Plus Me	etaDi Fluid Extender a.	s desired				
Imaging & Analysis	Porosity Assessment, Coating Layer Thickness, Particle Sizing, Phase Area Percent						
Hardness Testing	Vickers, Knoop						
Talala 24. Altaunata	A Cton Mothed for TCC and	TDC Consissons of	uith Matallia Caatinaa				
Table 31: Alternate Sectioning	4-Step Method for TSC and Precision Saw with 15HC black	· · · · · · · · · · · · · · · · · · ·					
		de recommend for	thermal spray coatings				
Sectioning	Precision Saw with 15HC bla	de recommend for	thermal spray coatings	Relative Rotation	Time [min:sec		
Sectioning Mounting	Precision Saw with 15HC black Castable, typically with epoxy	de recommend for drawn under vacu Load - lbs [N] /	thermal spray coatings		Time [min:sec		
Sectioning Mounting Surface Apex Hercules H	Precision Saw with 15HC blace Castable, typically with epoxy Abrasive / Size 30µm Diamond	de recommend for drawn under vacu Load - lbs [N] / Specimen	thermal spray coatings		·		
Sectioning Mounting Surface Apex Hercules H Rigid Grinding Disc	Precision Saw with 15HC blace Castable, typically with epoxy Abrasive / Size 30µm Diamond water cooled 9µm MetaDi Supreme	de recommend for / drawn under vacu Load - lbs [N] / Specimen 6 [27]	thermal spray coatings Jum Base Speed [rpm]		Until Plane		
Sectioning Mounting Surface Apex Hercules H Rigid Grinding Disc UltraPad	Precision Saw with 15HC blace Castable, typically with epoxy Abrasive / Size 30µm Diamond water cooled 9µm MetaDi Supreme Diamond* 3µm MetaDi Supreme	de recommend for v drawn under vacu Load - lbs [N] / Specimen 6 [27]	thermal spray coatings uum Base Speed [rpm] 300 150		Until Plane 4:00		
Sectioning Mounting Surface Apex Hercules H Rigid Grinding Disc UltraPad TriDent ChemoMet	Precision Saw with 15HC blace Castable, typically with epoxy Abrasive / Size 30µm Diamond water cooled 9µm MetaDi Supreme Diamond* 3µm MetaDi Supreme Diamond* 0.02 - 0.06µm MasterMet Colloidal Silica	de recommend for v drawn under vacu Load - lbs [N] / Specimen 6 [27] 6 [27]	thermal spray coatings aum Base Speed [rpm] 300 150 150		Until Plane 4:00 3:00		
Sectioning Mounting Surface Apex Hercules H Rigid Grinding Disc UltraPad TriDent ChemoMet	Precision Saw with 15HC blace Castable, typically with epoxy Abrasive / Size 30µm Diamond water cooled 9µm MetaDi Supreme Diamond* 3µm MetaDi Supreme Diamond* 0.02 - 0.06µm MasterMet Colloidal Silica	de recommend for v drawn under vacu Load - Ibs [N] / Specimen 6 [27] 6 [27] 6 [27] 4 [18]	thermal spray coatings aum Base Speed [rpm] 300 150 150 150 s desired	Relative Rotation Relative Rotation Relative Rotation	Until Plane 4:00 3:00		



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for specimens with ceramic coatings are given, see Tables 30-32.

The 30µm resin bonded, or the 45µm metal bonded UltraPrep diamond discs, can be substituted for the planar grinding step. (Table 30 and 31). UltraPol or UltraPad cloths can be used in the second step. (Table 30 and 32).



NiCrAlY thermally-spray coated steel specimen revealing a small amount of porosity (black spots), linear detachments (elongated black lines), and inclusions (gray particles) (unetched, 100X).



Microstructure of a steel substrate covered by two thermallysprayed layers, a NiAl bond coat and yittria-zirconia top coat (unetched, 100X). The bond coat contains pores, linear detachments and inclusions while the top coat is quite porous.

Table 32: 4-Step	Method	for Cera	mic Therma	al Sprav	Coatings

Sectioning	Precision Saw with 15HC blade recommend for thermal spray coatings						
Mounting	Castable, typically with epoxy drawn under vacuum						
Surface	Load - lbs [N] / Abrasive / Size Specimen Base Speed [rpm] Relative Rotation Time [min:sec						
Apex Color Red	75µm Diamond water cooled	5 [22]	300		Until Plane		
Apex Hercules S Rigid Grinding Disc	9µm MetaDi Supreme Diamond*	5 [22]	150		4:00		
TriDent	3µm MetaDi Supreme Diamond*	6 [27]	150		3:00		
ChemoMet	0.02 - 0.06µm MasterMet Colloidal Silica	6 [27]	150		2:00		
= Platen							
Imaging & Analysis	Porosity Assessment, Coating Layer Thickness, Particle Sizing, Phase Area Percent						
Hardness Testing	Vickers, Knoop						