

Application Case Study

Unmounted Ferrous Steels

Prepare High Quality Samples in Minutes Using the PlanarMet 300 Planar Grinder and EcoMet/AutoMet



Ferrous bar material

Background

Unmounted samples are often used in foundry and heat treatment companies with a high sample volume. Samples are usually clamped in a central force sample holder without prior mounting.

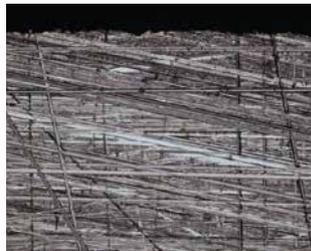
One of the biggest issues with unmounted sample is the surface flatness, so it is essential to use hard polishing cloths with no or low nap to minimize edge rounding. The polishing times should be as short as possible.

Select a polishing cloth which can withstand sharp edges to ensure a good cloth lifetime. A good selection is the UltraPad™ or TexMet™ P cloth at a 9µm step and the MicroFloc cloth at a 3µm step or finer.

Preparation



Unmounted bar material clamped in a central force 1.25in [32mm] specimen holder (60-5282)



Surface quality after grinding on PlanarMet 300, 120 [P120] grit Alumina. Magnification 200x



Surface quality after polishing on MicroFloc with 3µm MetaDi diamond suspension. Magnification 200x



Martensitic structure with surface oxidation. Etched with Nital 3%, Magnification 200x

Sectioning

Equipment: AbrasiMet™ 250

Consumable: Abrasive wheel for hard ferrous materials

The as-received bar material were cut in cross section and after this directly clamped into a sample holder.



Grinding & Polishing

Equipment: PlanarMet™ 300

The initial grinding step is carried out on the PlanarMet 300. Preparation is fast and produces exceptionally flat samples.

Parameters:

Grinding setting:

Load: 70 lbs [300N] (per 10 samples)

Cycle time: 1:30 Minutes

Head RPM: 120

Platen: Contra

Wheel Type: Aluminium oxide wheel, 120 [P120] grit



The initial grinding step utilized the 120 [P120] grit alumina grinding wheel and lead to high stock removal at minimized surface deformation. The surface flatness is superb after this grinding step. To ensure accuracy of final examination, additional preparation steps need to maintain this flatness.

Equipment: EcoMet™/AutoMet™ 300

The Ecomet/AutoMet 300 was used to polish the specimens using a 12in [305mm] platen. The mounted specimens were polished in central force mode with only two steps.



Preparation (cont'd)

3-Step Method for Unmounted Ferrous Materials using the PlanarMet™ 300 and EcoMet™/AutoMet™ 300

Surface	Abrasive / Size	Load - lbs [N] / Specimen	Platen Speed [rpm]	Head Speed [rpm]	Relative Rotation	Time [min:sec]
Alumina Grinding Stone	120 [P120] grit	7 [30]	Fixed	120		1:00
UltraPad™	9µm MetaDi Supreme Diamond*	7 [30]	150	60		4:00
MicroFloc	3µm MetaDi Supreme Diamond*	7 [30]	150	60		4:00

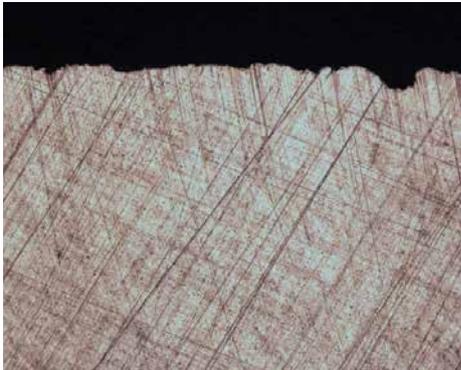
 = Platen
  = Specimen Holder
 *Plus MetaDi Fluid Extender as desired

Analysis

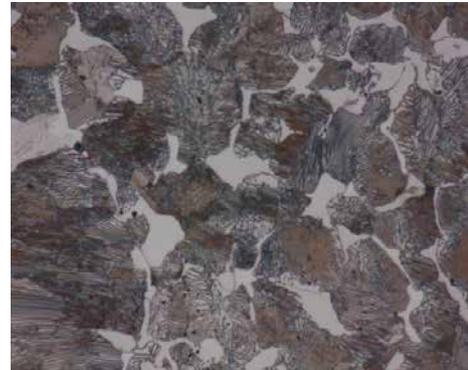
Imaging & Analysis

Equipment: Nikon Eclipse MA200 Inverted Microscope

The prepared specimens were inspected at magnifications between 50X and 200X at the eyepiece for a Nikon MA200 compound microscope equipped with a 3.1MP UEye digital microscopy camera using bright field illumination (BF).



Surface quality after polishing on UltraPad with 9µm MetaDi diamond suspension. Magnification 200x



Ferrite and fine lamellar Pearlite in the center of the material. Etched with Nital 3%, Magnification 200x.

Conclusion:

A good surface finish was achieved after less than 2 minutes on the Planarmet 300 Planar Grinder. No additional coarse grinding steps were required and excellent flatness was achieved on the specimens. Final polishing steps involved a 2-step procedure with the resultant finish faintly showing the grain structure.

Benefits:

Traditional preparation routes are arduous and take longer times. To mitigate this, Buehler has developed the PlanarMet 300 Planar Grinder enabling shorter preparation times with excellent surface finish and minimal deformation to the material.

Sectioning
AbrasiMet • AbrasiMatic • IsoMet

Mounting
SimpliMet

Grinding & Polishing
EcoMet • AutoMet • MetaServ

Imaging & Analysis
OmniMet

Hardness Testing
Wilson® Hardness



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