

Preparing Unmounted Ferrous Steels in Minutes Using the PlanarMet 300 Planar Grinder and EcoMet/AutoMet

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Introduction

Foundry and heat treatment firms with a high sample volume frequently use unmounted samples. A central force sample holder, without prior mounting, is often used for clamping the specimens. As surface flatness is a major issue with unmounted samples, it is necessary to utilize hard polishing cloths with no or low nap to minimize edge rounding. The polishing process time should be as short as possible.

This article discusses the preparation of high quality unmounted steel specimens in a short time, using a [PlanarMet 300 Planar Grinder](#) and [EcoMet/AutoMet](#). The polishing cloth should be selected to survive sharp edges to ensure a good cloth lifetime. The UltraPad™ or TexMet™ P cloth at a 9 µm step and the

Preparation

Sectioning

The as-received bar material was cut in a cross-section. This sectioned sample was directly fixed in a specimen holder on the AbrasiMet™ 250 (Figure 1). Abrasive wheels for hard ferrous materials were utilized as a consumable.



Figure 1. Unmounted bar material clamped in a central force 1.25 in [32 mm] specimen holder

Grinding and Polishing

A PlanarMet 300 was used to perform the preliminary grinding process. The preparation is less time-consuming and results in ideally flat samples. Table 2 lists the parameters used.

Table 2. Grinding and Polishing Parameters

Grinding setting	
Load	70 lbs [300 N] (per 10 samples)
Cycle time	1:30min
Head RPM	120
Platen	Contra
Wheel Type	Aluminium oxide wheel, 120 [P120] grit

A 120 [P120] grit alumina grinding wheel was used for the preliminary grinding stage to achieve a high rate of material removal with minimal surface deformation (Figure 2). A good surface flatness is achieved after the grinding stage. Extra preparation is required to maintain the flatness to enable accuracy during the final examination.

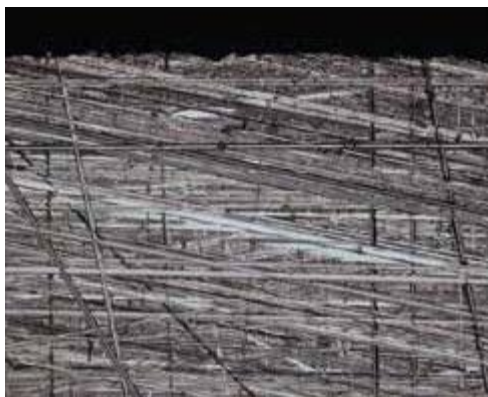





Figure 2. Surface quality after grinding on PlanarMet 300, 120 [P120] grit Alumina. Magnification 200x

The samples were polished with the Ecomet/AutoMet 300 using a 12 in [305 mm] platen. The samples were polished in two steps in a central force mode (Figure 3). Table 3 shows the grinding and polishing parameters.



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

Table 3. 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	9 μm MetaDi Supreme Diamond*	7 [30]	150	60		4:00
MicroFloc	3 μm MetaDi Supreme Diamond*	7 [30]	150	60		4:00

● = Platen

● = Specimen Holder

*Plus MetaDi Fluid Extender as desired

Imaging and Analysis

The prepared samples were analyzed at the eyepiece of a Nikon LV150 compound microscope, equipped with a 3.1MP UEye digital microscopy camera using bright field illumination (BF) (Figures 4 and 5). A magnification range between 50X and 200X was chosen for the eyepiece.

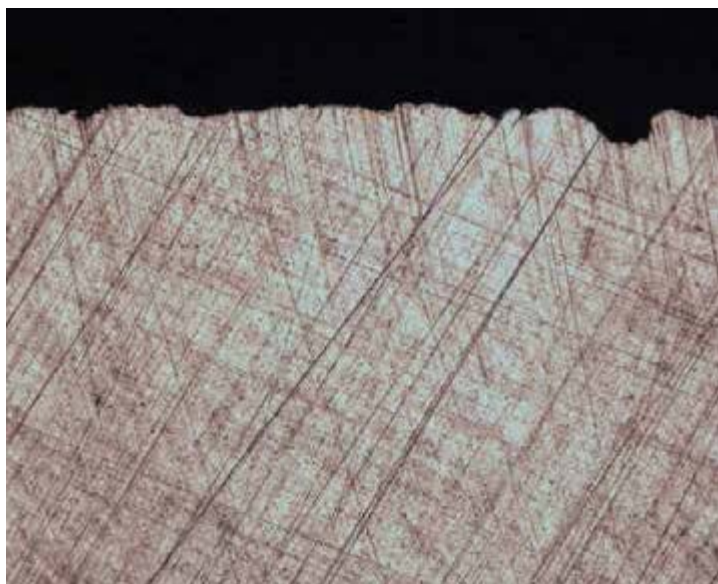


Figure 4. Surface quality after polishing on UltraPad with 9 μm MetaDi diamond suspension. Magnification 200x.

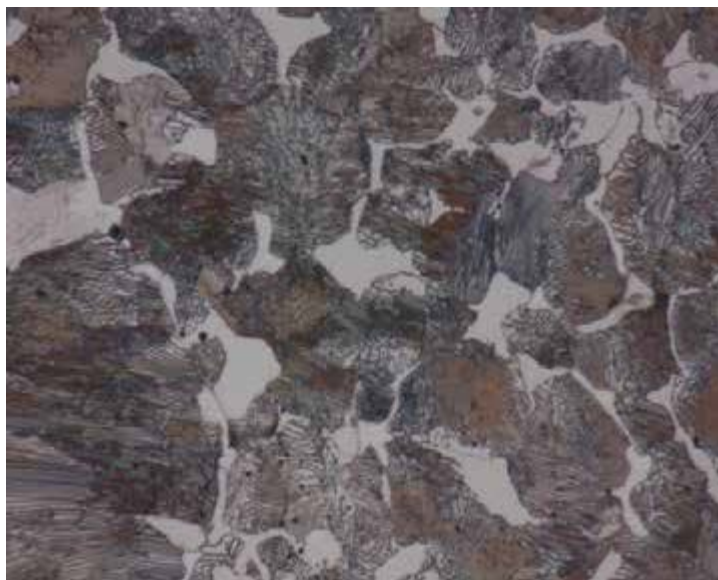


Figure 5. Ferrite and fine lamellar Pearlite in the center of the material. Etched with Nital 3%, magnification 200x.

Conclusion

After less than 2 minutes of operation on the [Planarmet 300 Planar Grinder](#), a good quality surface finish was obtained. Additional coarse grinding steps were not needed, and excellent flatness was realized on the samples. A 2-step final polishing procedure resulted in a surface finish where the grain structure can only be faintly observed.

Conventional preparation methods are time-consuming and laborious. Conversely [Buehler's PlanarMet™ 300](#) shortens the preparation times, achieves an ideal surface finish with little material deformation.



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Fungilab's main focus since its establishment has been to research, develop and manufacture the most advanced viscometers in order to offer our clients the highest and most accurate performance in the viscosity measurement. In this interview, AZoM speaks to Fungilab CEO, Ernest Buirra.

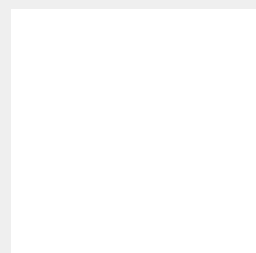


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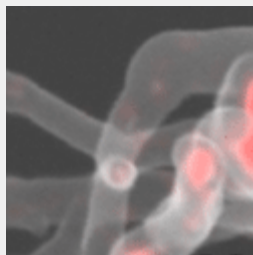


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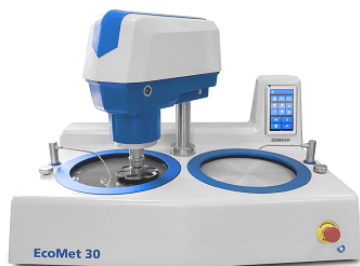


Related ANSI Standards

ASTM C24-09(2013): Standard Test Method for Pyrometric Cone Equivalent (PCE) of Fireclay and High Alumina Refractory Materials

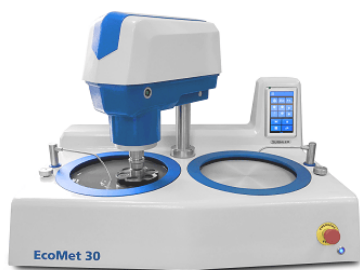
ASTM A1009-05(2010): Standard Specification for Soft Magnetic MnZn Ferrite Core Materials for High Frequency (10 kHz-1 MHz) Power Transformer and Filter Inductor Applications

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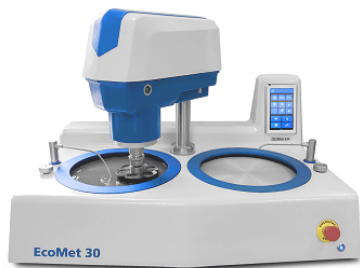


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