Metkon Application Note

Metallographic Preparation of Aluminum Billet

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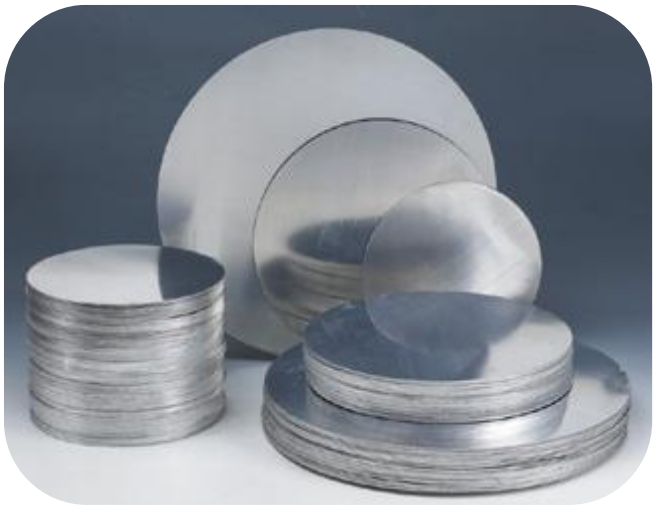
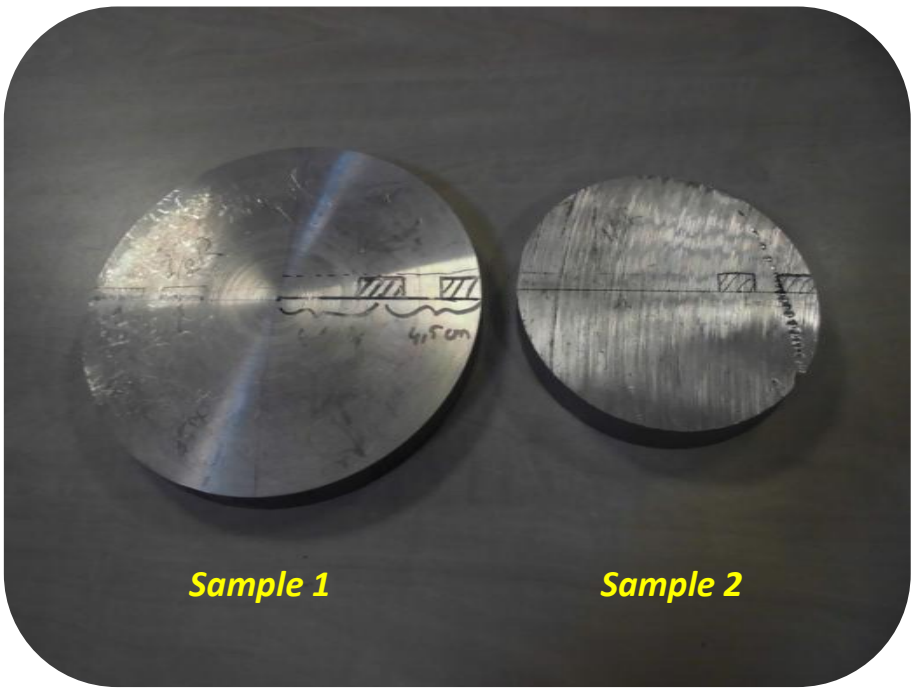
metkon® METALLOGRAPHY



Aluminum (or **aluminum**; see spelling differences) is a chemical element in the boron group with symbol **Al** and atomic number 13. It is a silvery white, soft, ductile metal. Aluminum is the third most abundant element (after oxygen and silicon), and the most abundant metal in the Earth's crust. It makes up about 8% by weight of the Earth's solid surface.

Aluminum metal is so chemically reactive that native specimens are rare and limited to extreme reducing environments. Instead, it is found combined in over 270 different minerals. The chief ore of aluminum is bauxite.

Investigated samples with requested cutting lines.

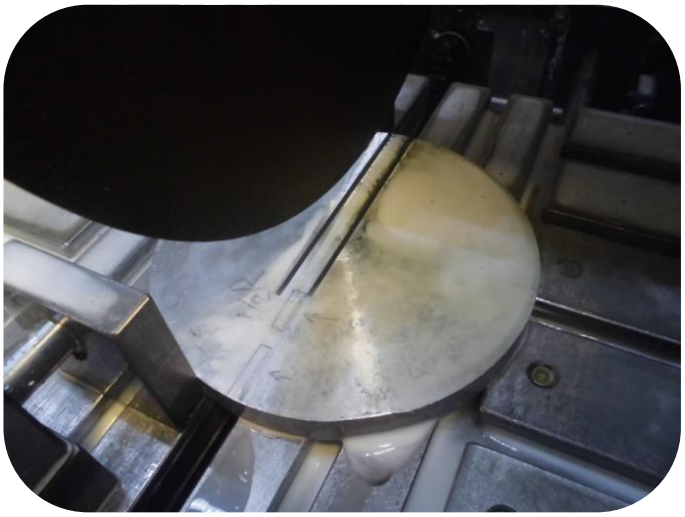


SECTIONING

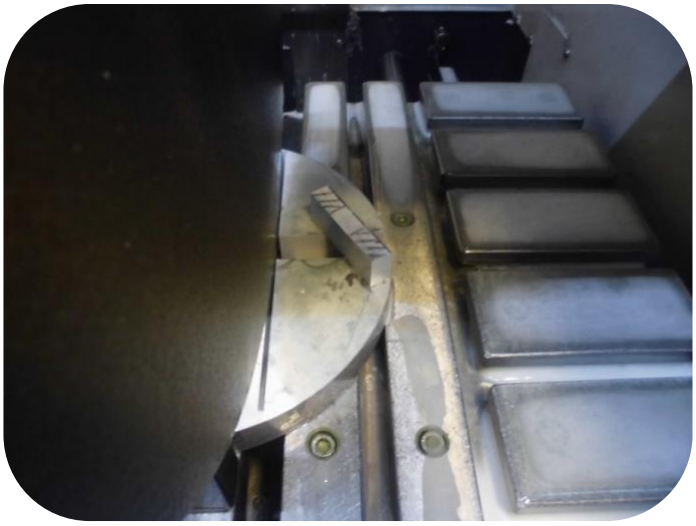
SERVOCUT 401-AA 14 67
Automatic Abrasive Cutting Machine
Programmable with 5,7" HMI touch screen control, with s
Siemens PLC control unit, with automatic chop cutting and automatic table-feed cutting systems, with various cutting methods, programmable with coloured LCD display of cutting parameters, accurate and motorized positioning of the specimen in X - Y and Z axis (X-axis for plane parallel cutting is optional), integrated feed path control, power dependent adjustable feed rate, variable cutting force, pulse cutting mode, bar graph overload display, compact cutting motor, 2200 rpm cutting speed, with electronic brake system, cutting capacity upto 130/150 mm solid stock, with cut-off wheels upto ø350/400mm, twin T-slotted table(Y-direction only) made of stainless steel, bottom part as rugged alloy base casting, 120 lt recirculating cooling unit with connection hoses, ready for operation.
Without clamping devices.
Includes a standard set of cutting consumables composed of;
*An assortement of 20 cut-off wheels with 400 mm dia.
*5 lt of Metcool cooling fluid.
400 V, 3 phase, 50 Hz.

ECOPRESS 100 25 07
Programmable Automatic Mounting Press with one cylinder, 5,7" HMI touch screen control, with Siemens PLC control unit, programmable with coloured LCD display, program based mounting sequences, electro hydraulic pressure (requires no air), pressure upto 300 bar, temperature upto 200 C, operation time upto 59:99 minutes, short cycle time, thermostatically controlled heating power of 1250W, automatic cooling cycle with two modes of cooling rates(fast cooling and slow cooling), programmable preheating and preloading, selectable mould sizes from 25 mm to 50 mm, audible warning signal, ready for operation.
230 V, 1-phase, 50 Hz.
Mould assemblies are ordered seperately.
Includes a standard set of mounting consumables composed of 3 different hot mounting compounds; 1 kg of each and a total of 3 kg.

FORCIPOL 2V (with FORCIMAT) / 36-09-250 (30 09)
Grinding and Polishing Machine
Double wheel,suitable for 200 mm and 250 mm wheel size, standard interface for FORCIMAT automatic specimen mover variable speed between 50-600 rpm, with digital display, 3/4 HP motor with overload protection, including water inlet and outlet.
230 V, 1-phase, 50 Hz.
Includes a standard set of grinding & polishing consumables;
*An assortement of 100 grinding papers(various grits), 200 mm dia.
*An assortement of 5 polishing cloths with 200 mm dia.
*Diamond suspensions, one of each of 6 mic. and 1 mic., plus lubricant



The sample is attached as it shown in the above photos with GR 0170 Quick acting clamping vise.

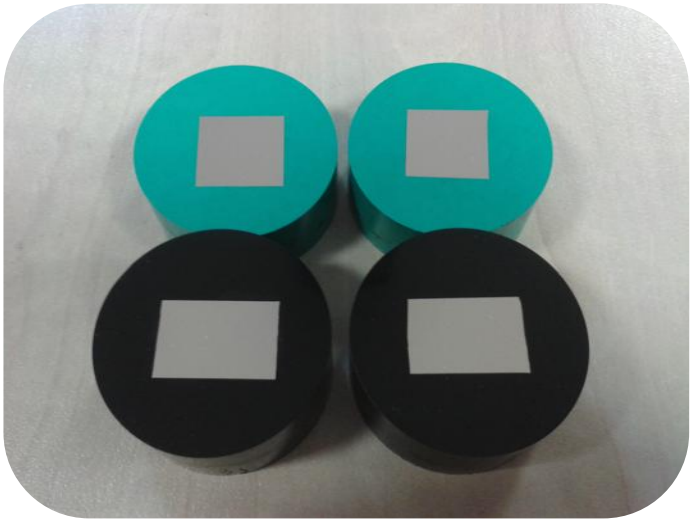


The cutting parameters are below;

FEEDRATE	300 µ/sec
PULSE	-
TRAVEL	70 mm
FORCE	8 A
RPM	2000 r/min

Mounting parameters are;

Equipment: Ecopress 100
Mould Assembly Dia: 40 mm
Mould Release: SMOOTH
Order Code: 29-099
Mounting Powder: DAP & EPO
Order Code: 29-012 & 29-011
Description: By using DAP & EPO
Mounting Powder the temperature is set to 190 ^{o}C and the pressure is set to 250 bar.

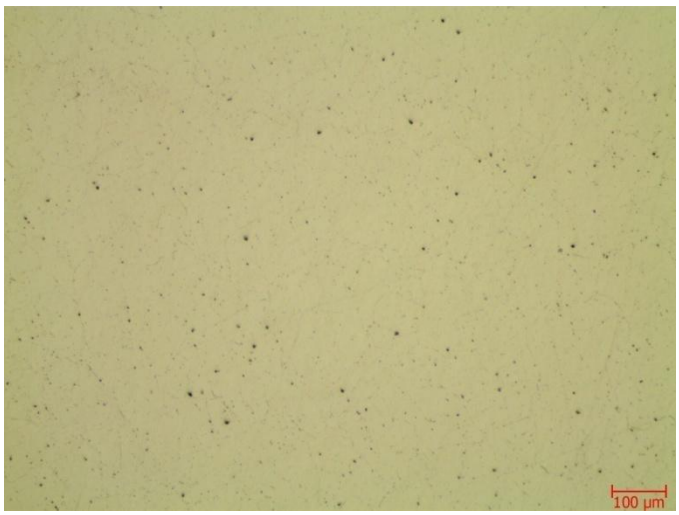


Polishing operation made with FORCIPOL 2V + FORCIMAT system and parameters are following;

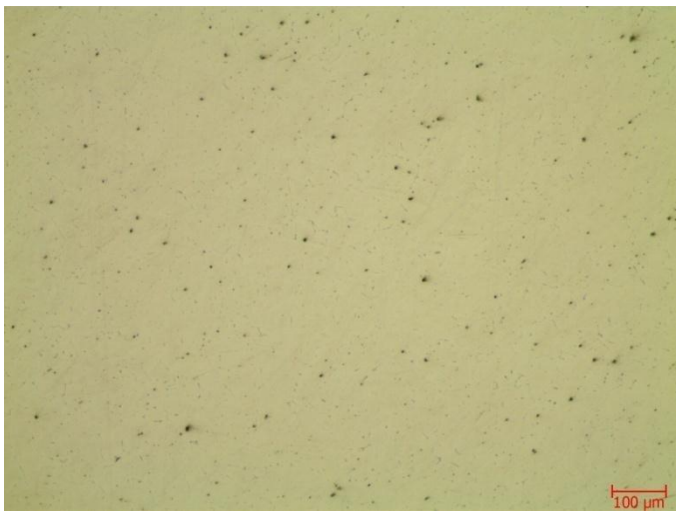
	Surface	*Abrasive*	*Lubricant*	*Force per sample(N)*	*Time(min.)*	*Disk speed(rpm)*	*Head speed(rpm)*
Grind. Step 1	*DEMPAX* *38-020-320*	320 grit SiC	Water	12 N	2 min.	*200 CW*	*100 CCW*
Grind. Step 2	*DEMPAX* *38-020-600*	600 grit SiC	Water	12 N	2 min.	*200 CW*	*100 CCW*
Grind. Step 3	*DEMPAX* *38-020-1200*	1200 grit SiC	Water	12N	2 min.	*200 CW*	*100 CCW*
Grind. Step 4	*DEMPAX* *38-020-2000*	2000 grit SiC	Water	12N	2 min	*200 CW*	*100 CCW*
Grind. Step 5	*DEMPAX* *38-020-4000*	4000 grit SiC	Water	12N	2 min	*200 CW*	*100 CCW*
Polish. Step 1	*METAPO-B* *39-033-250*	*DIAPAT-M 3µ* *39-420-M*	*DIAPAT* *39-502*	15 N	5 min.	*200 CW*	*100 CCW*
Polish. Step 2	*FEDO-1* *39-065-250*	*DIAPAT-M 1µ* *39-410-M*	*DIAPAT* *39-502*	15 N	4 min.	*200 CW*	*100 CCW*
Etching with **10% HF + Water solution**							

RESULT

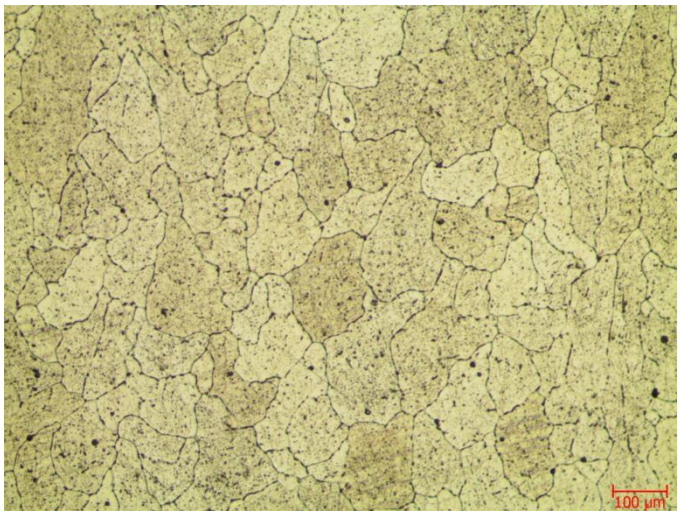
After the preparation Al samples observed in the metallographic microscope with IMAGIN hardware set and GRANO Grain size measurement module. Microstructure of Al samples can be seen below.



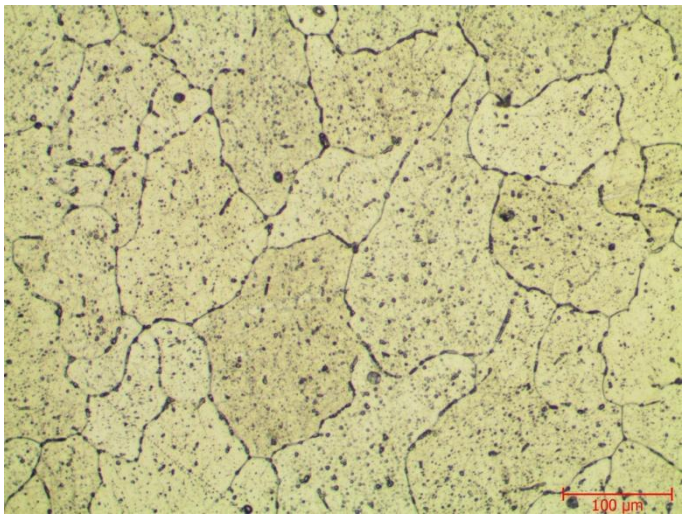
Sample 1 – After polishing x100



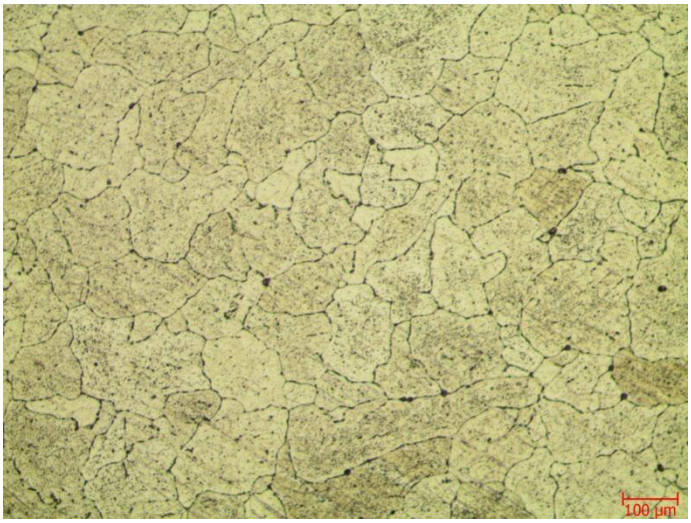
Sample 2 – After polishing x100



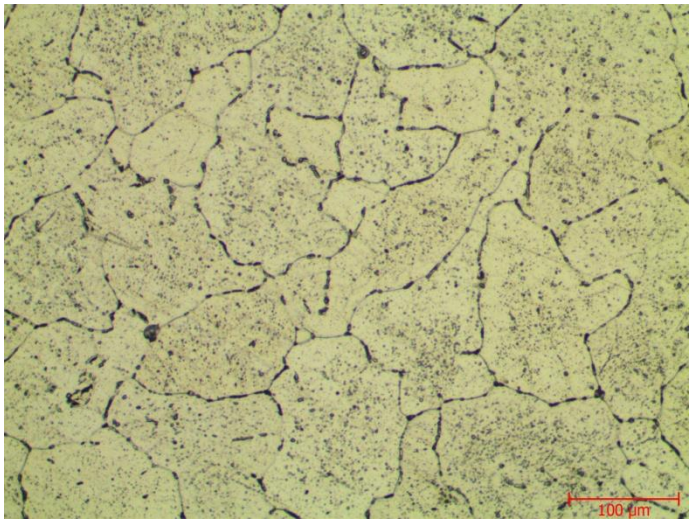
Sample 1 (from edge area) - After etching x100



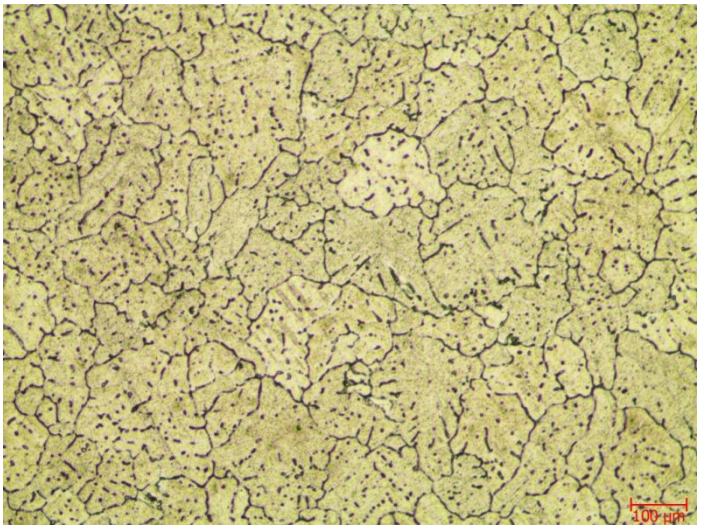
Sample 1 (from edge area) - After etching x200



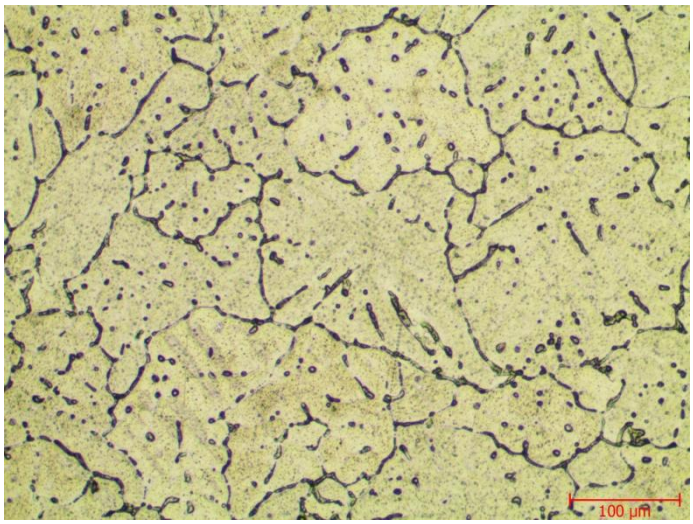
Sample 1 (from center area) - After etching x100



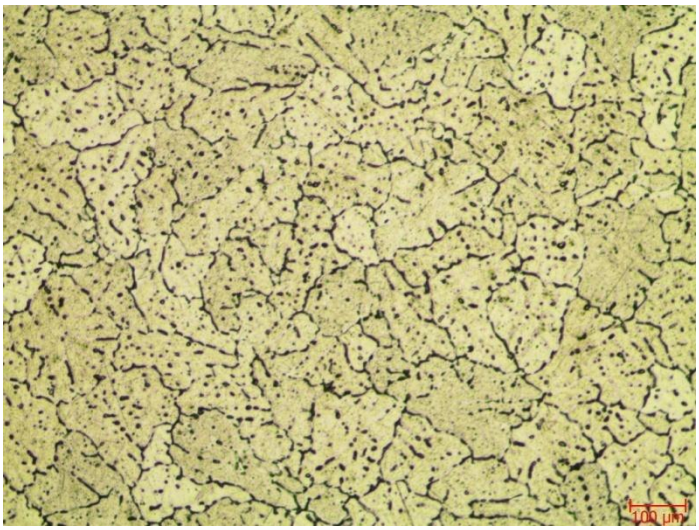
Sample 1 (from center area) - After etching x200



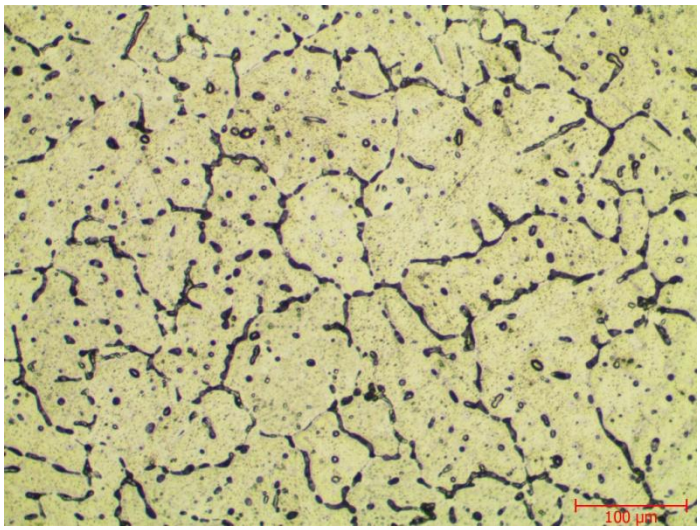
Sample 2 (from edge area) - After etching x100



Sample 2 (from edge area) - After etching x200

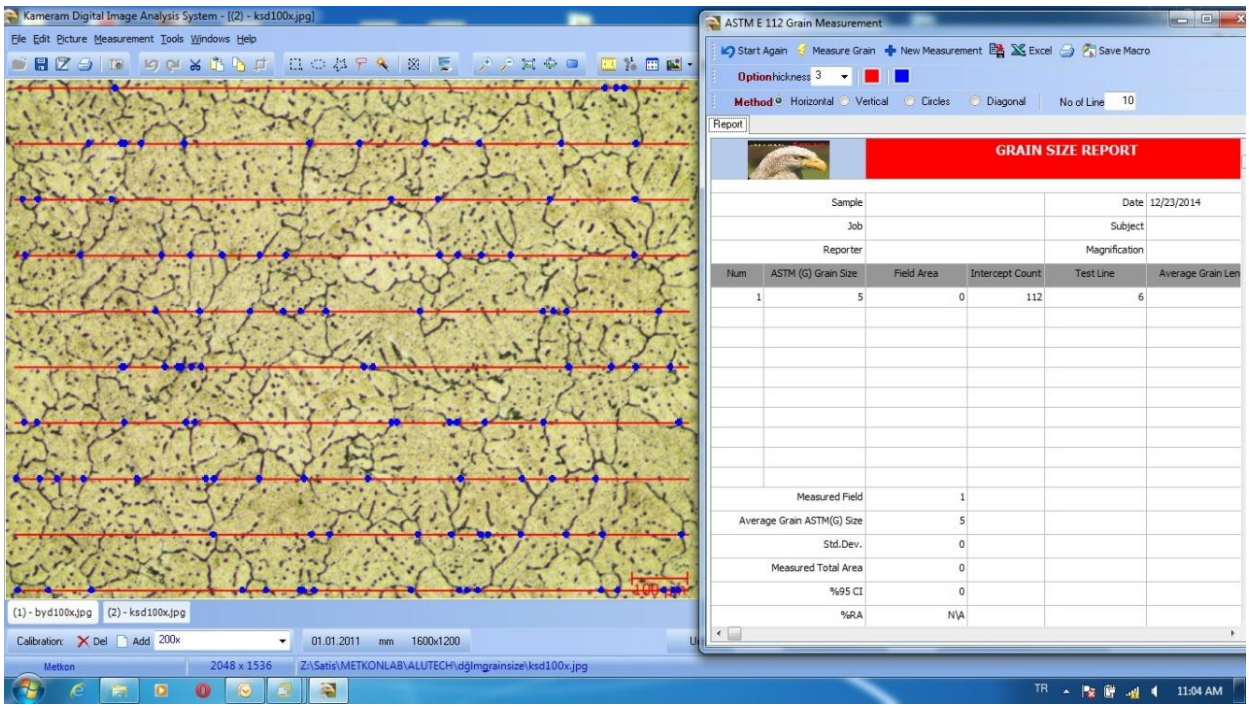


Sample 2 (from center area) - After etching x100



Sample 2 (from center area) - After etching x200

By the help of **GRANO** module grain size measurement can be made according to ASTM E112.



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