

S S N

STOWARZYSZENIE
STAL NIERDZEWNA

Poznan, Metalforum Fairs

Innovative process for ecological pickling on stainless steel welds and Electrochemical marking for decorations of stainless steel surfaces

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UNIVERSITÀ DEGLI STUDI
DI MODENA E REGGIO EMILIA

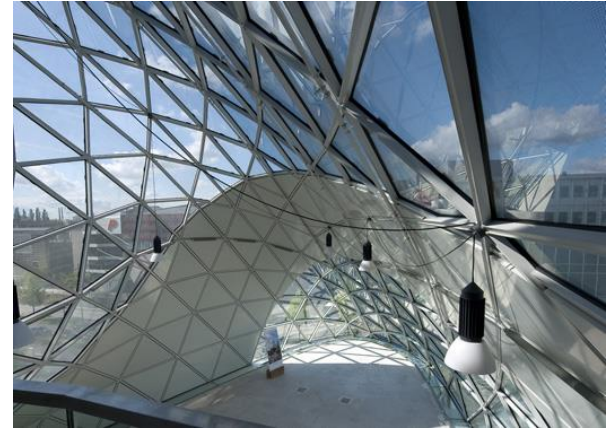
Federico Guerrieri,
Nitty-Gritty S.R.L.
Spilamberto (MO) - ITALY

nitty gritty

Pharmaceutical



Architecture



STAINLESS STEEL



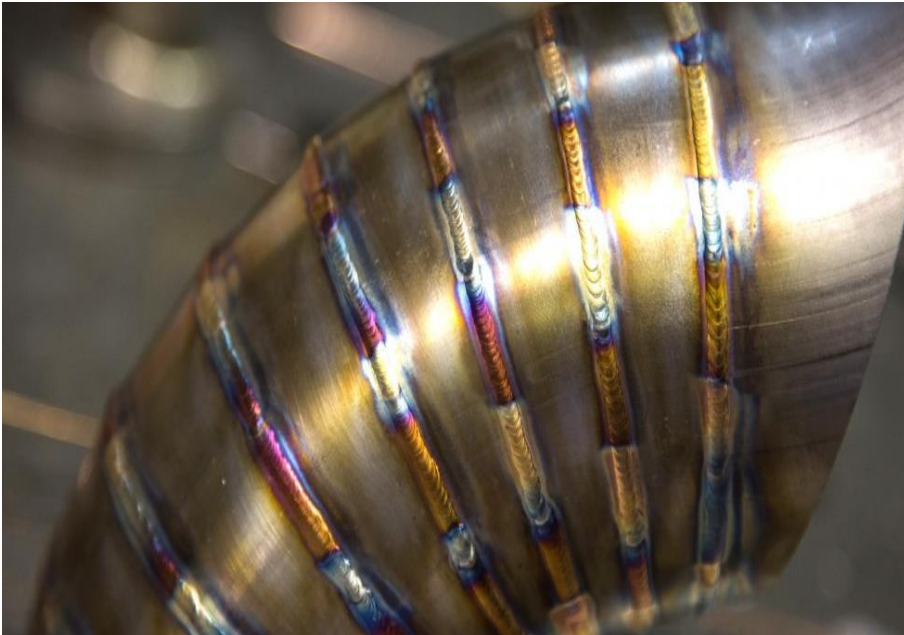
Food Factory



Oil&Gas



POST-WELDING SURFACE TREATMENT



TIG WELDING on STAINLESS STEEL

1. Restore the pre-welding aesthetic

Complete removal of iridescence

2. Remove non-protective oxides

Removal of iron porous oxides

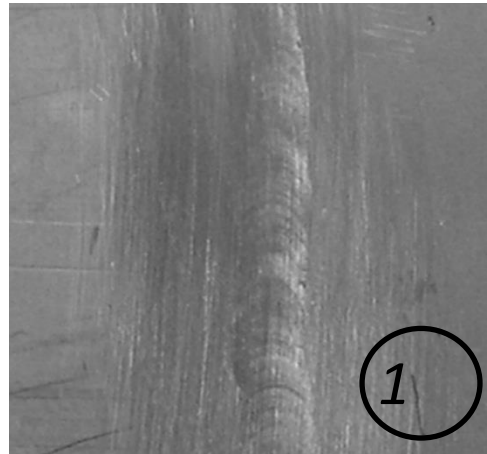
3. Re passivate the treated surface

Formation of chromium oxide on the surface

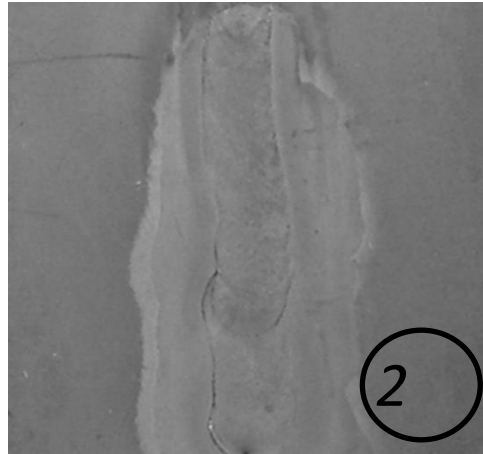


POSSIBLE TREATMENTS

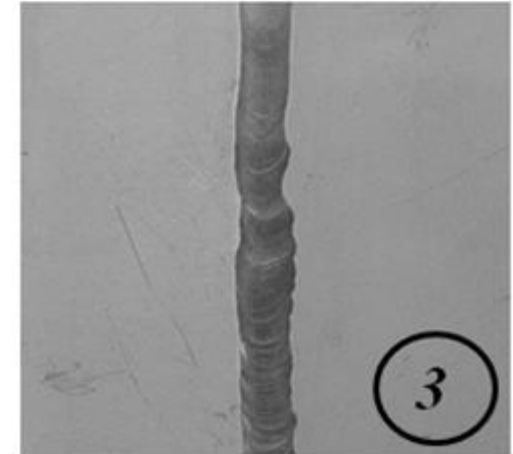
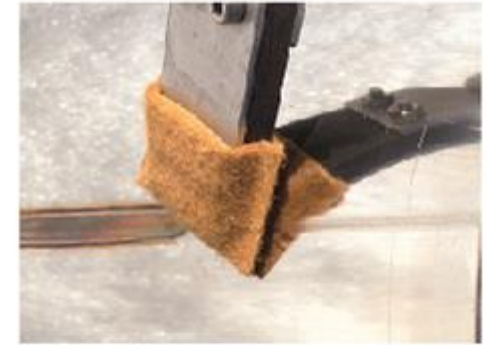
MECHANICAL
(Abrasives No
Passivation)



CHEMICAL (Toxic Acids)



Electrochemical
(Electrolyte + Current)



nitty gritty

MAKE IT SHINE

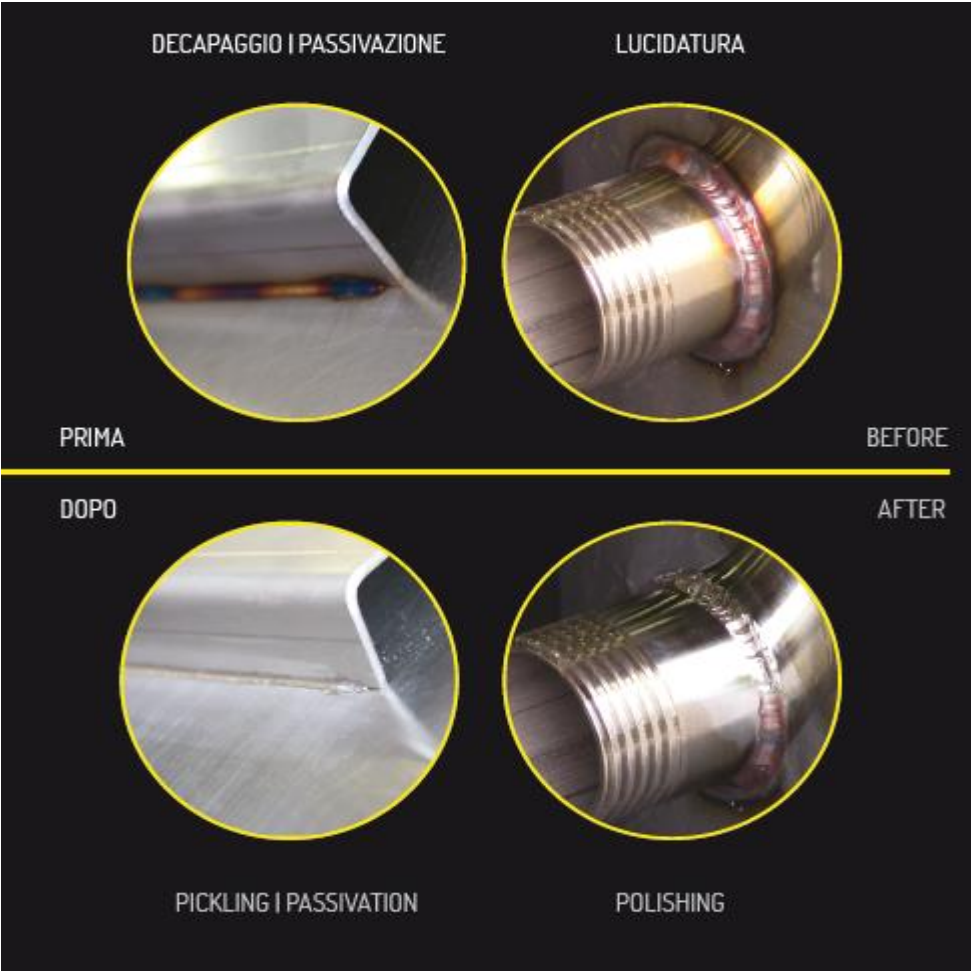
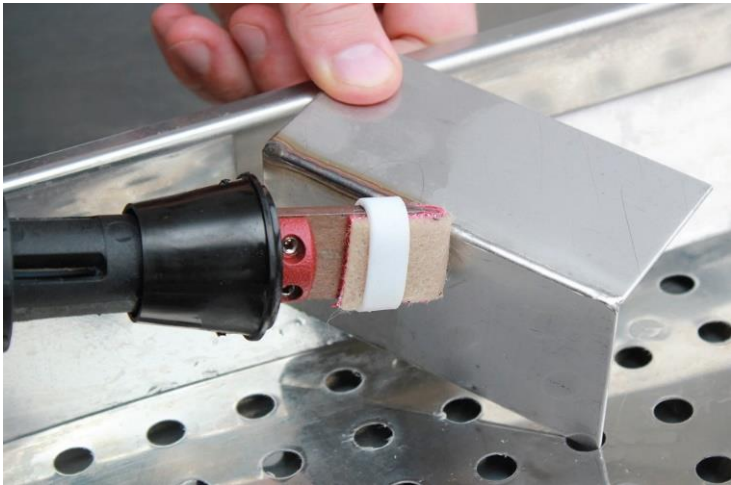


Founded in 1995, Nitty-Gritty provides ecological stainless steel surface treatment solutions which are "down to earth", "innovative" (lot of patents) and "straightforward" (easy to use).

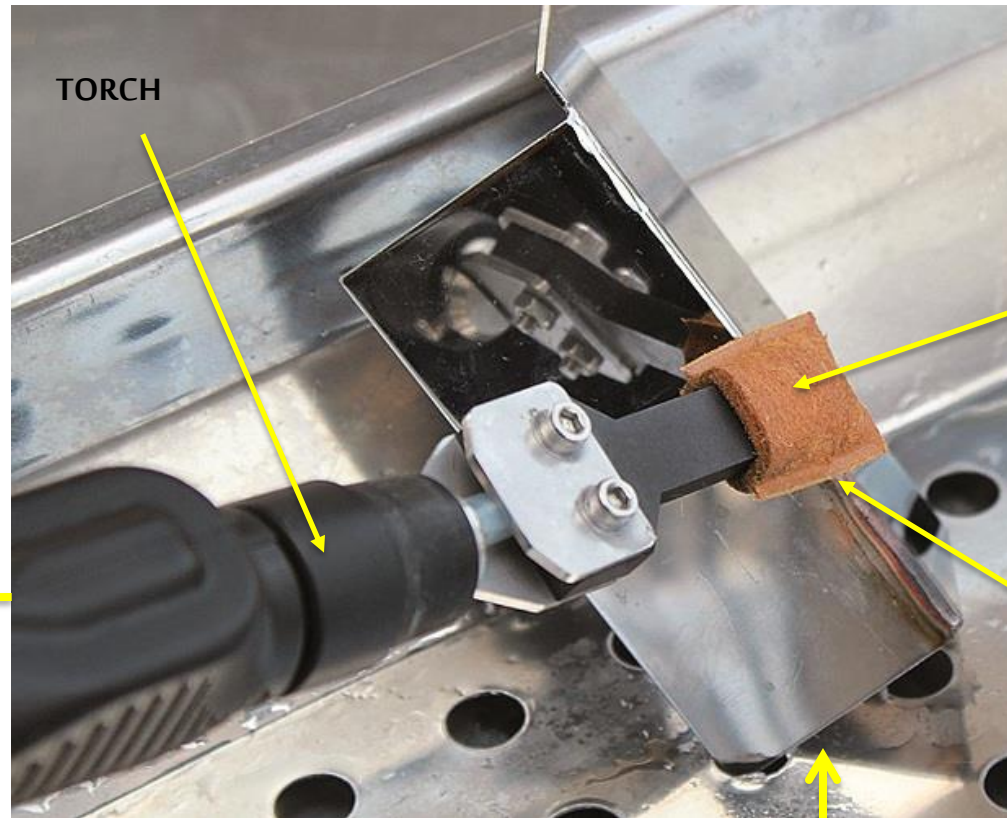
Nitty-Gritty's mission is to provide simple and innovative systems to improve the quality of finished products and take care of the operator safety and environment.



WELD CLEANING / POLISHING & PASSIVATION



WELD CLEANING / POLISHING & PASSIVATION



TORCH

PAD / BRUSH
+
ELECTROLYTE

LOCAL INSTANT
CLEANING / POLISHING
and PASSIVATION

PWR GENERATOR:
INVERTER BOARD
WITH P.F.C.
(ISO EN 61000-3-2)



IMPROVE ECOLOGY & PERFORMANCE

1 WAY: R&D TO DEVELOP NEW ELECTROLYTES:

Aim of our reasearch:
Obtaining an electrolyte

+++ FASTER

+++ ECO FRIENDLY

+++ HIGHER PASSIVATION



PICKLING GEL
(TOXIC STRONG ACIDS)



FOOD GRADE ACIDS
(PURE)



FOOD GRADE ACIDS
(WATER BASED)



pH
NEUTRAL

NEUTRAL pH
SALT SOLUTION



IMPROVE ECOLOGY & PERFORMANCE

2 WAY: R&D TO IMPROVE ELECTRONICS:



TRANSFORMER : NEVER USED

-- WEIGHT

-- NO POWER CONTROL

-- ONLY 44% EFFICIENCY



INVERTER BOARD

++ LIGHT

++ P.F.C. (ISO EN 61000-3-2)

++ 96% EFFICIENCY



Green
Technology

P.F.C.
(Power Factor Correction)
INSIDE



IMPROVE ECOLOGY & PERFORMANCE


3 WAY: OPERATOR'S SAFETY & FIRENDLY SOLUTIONS



GLI UNICI A DA AVERE IL SISTEMA DI ASPIRAZIONE/SOFFIO DEI VAPORI BREVETTATO.

THE ONLY ONES WITH A PATENTED VAPOR SUCTION/BLOW SYSTEM.

• PATENTED •



I PRIMI AD AVERE INTEGRATO LA POMPA AUTOMATICA PER IL DOSAGGIO DEL LIQUIDO DECAPANTE.

THE FIRST ONES TO INTEGRATE THE AUTOMATIC PUMP TO DOSE THE PICKLING LIQUID.



GLI UNICI AD AVERE BREVETTATO LA SECONDA TORCIA CON IL SERBATOIO INCORPORATO.

THE ONLY ONES WHO HAVE THE PATENTED TANK-INTEGRATED SECOND TORCH.

• PATENTED •



LA NOSTRA CLINOX REC È LA SOLA MACCHINA AL MONDO CHE RICIRCOLA E FILTRA L'ELETTROLITA.

OUR CLINOX REC IS THE ONLY MACHINE IN THE WORLD WHICH RECIRCULATES AND FILTERS THE ELECTROLYTE.

• PATENTED •



RESEARCH GOALS

Mission: Develop an alternative to the standard electrolyte, more environmentally friendly and non-corrosive



REDUCE SOLUTION HAZARD



INCREASE CORROSION RESISTANCE



INCREASE WORK SPEED

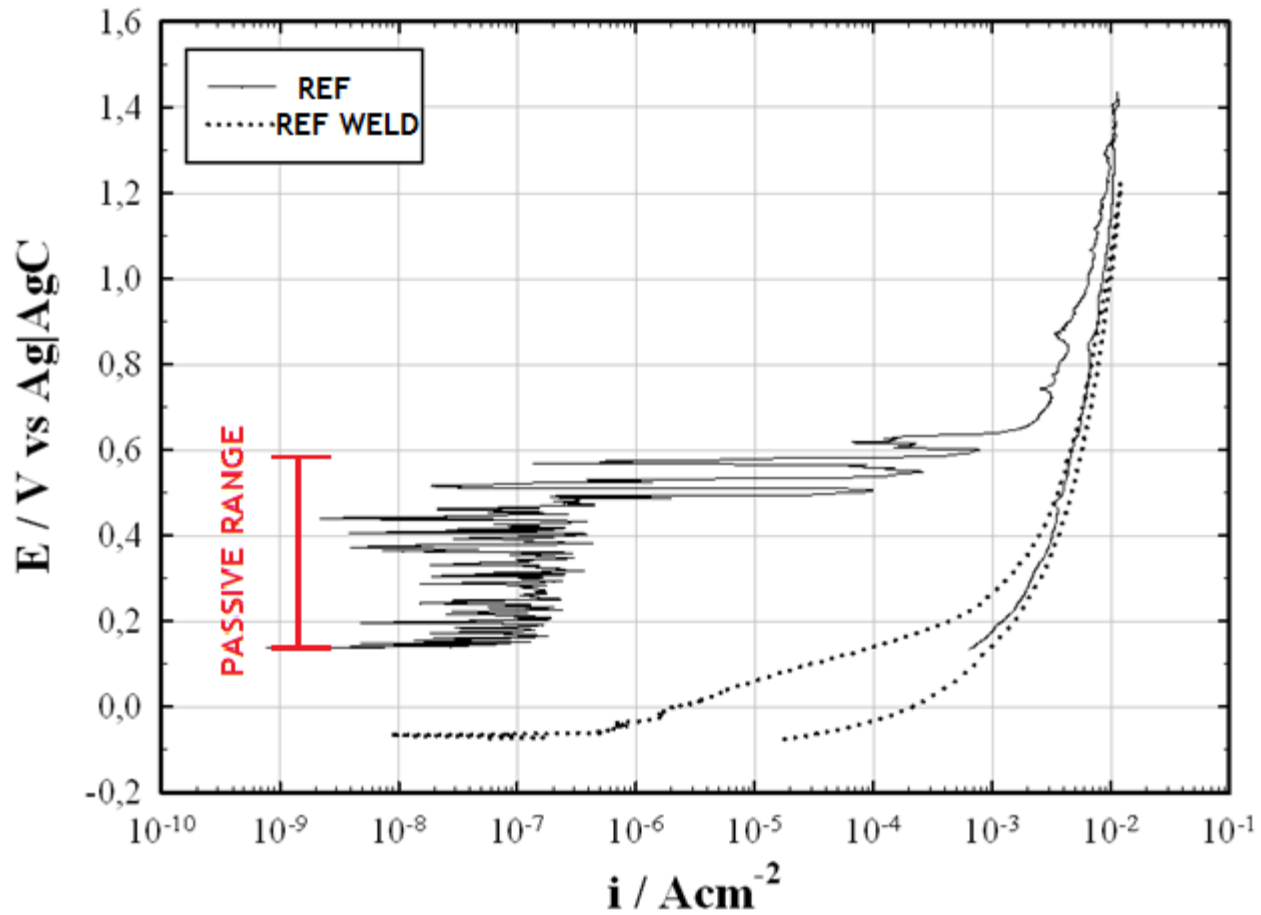


Samples: TIG welds on AISI 304 plates (100 x 100 x 1,5 mm)

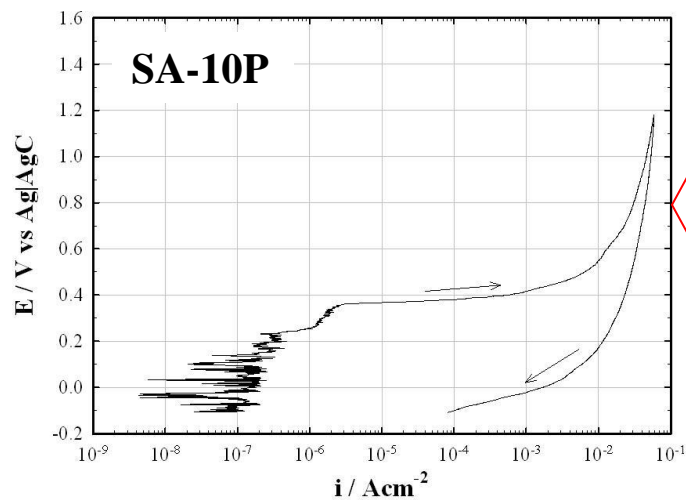
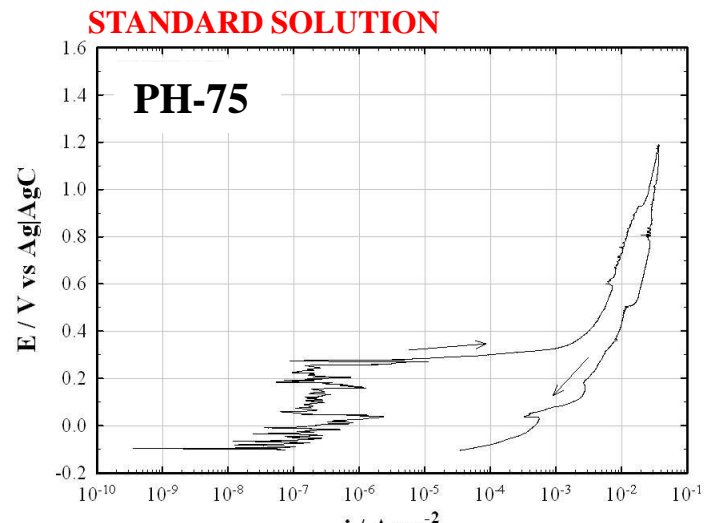
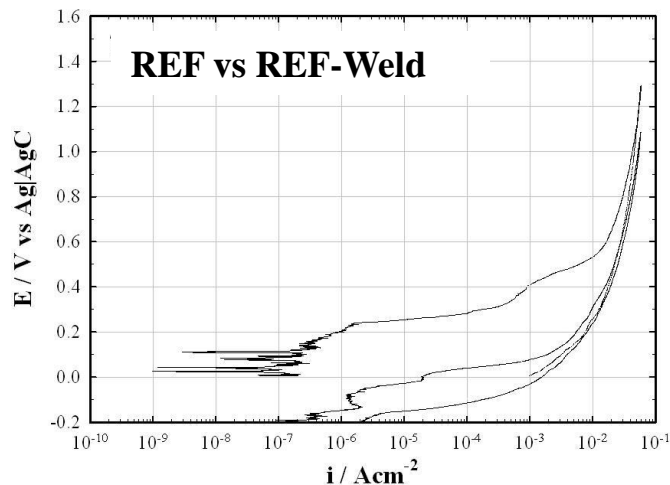


BEFORE and AFTER WELDING

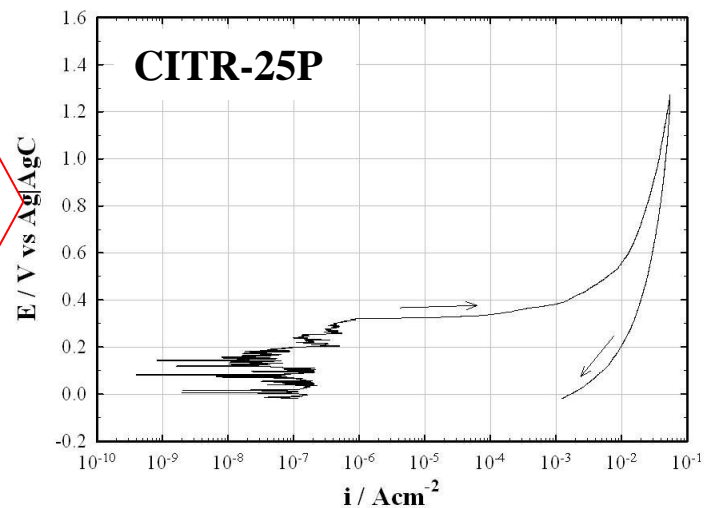
REF vs REF Weld



POLARIZATION CURVES



BEST RESULTS



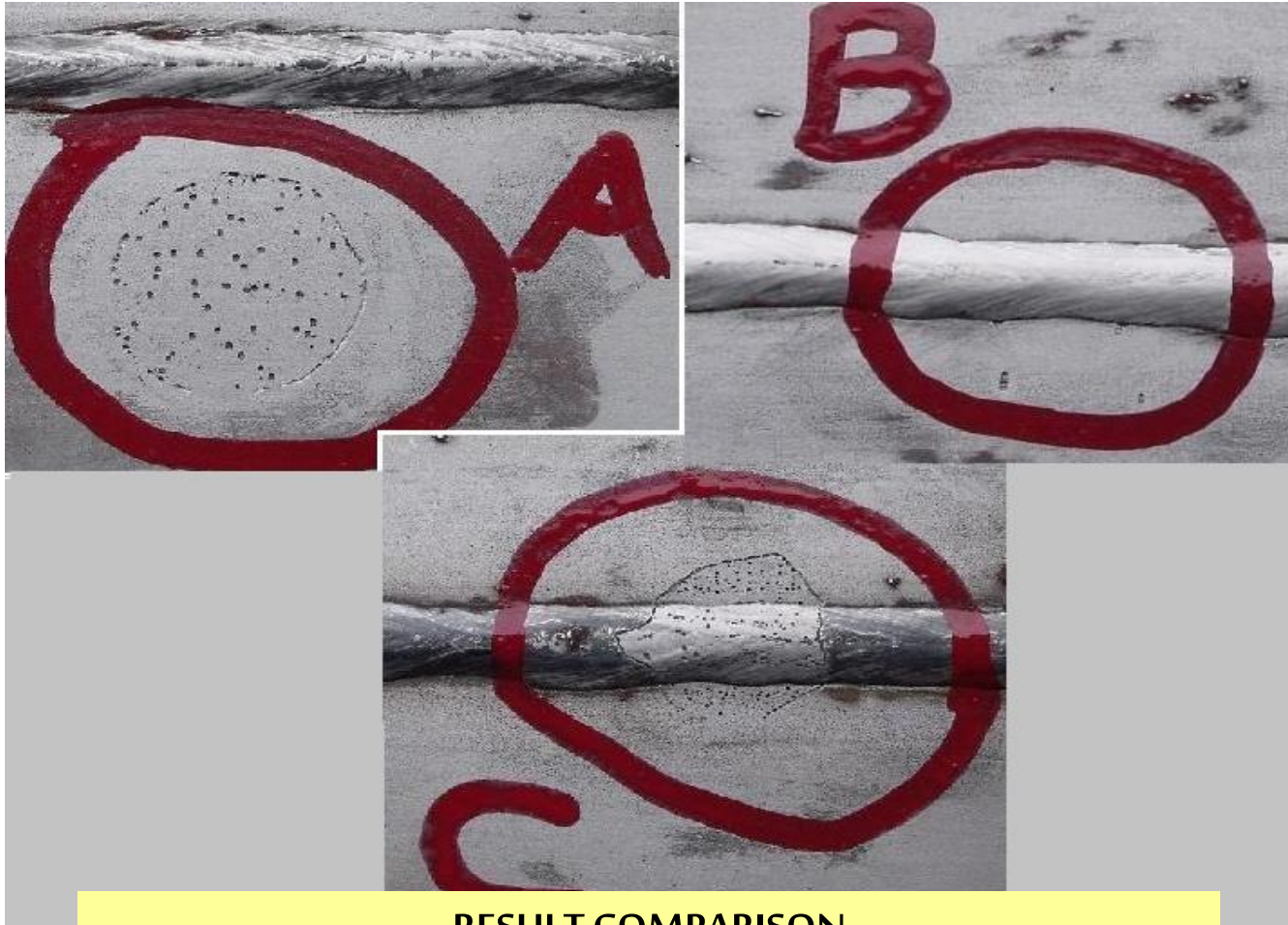
XPS ANALYSIS - DIFFERENT DEPTH

NOT WELDED	O	Fe	Cr	P
Surface	53.7	25.9	18.5	0

Atomic %	REF-WELD				PH-75				CITR-25P			
Elements	O	Fe	Cr	P	O	Fe	Cr	P	O	Fe	Cr	P
Surface	69.6	30.4	0	0	61.5	15.4	15.4	5.8	54.8	22.6	17.7	3.2
1°sputt.	63.1	36.8	0	0	52.5	27.1	16.9	0	42.6	36.0	14.8	0
2°sputt.	44.8	55.2	0	0	46.1	36.5	17.3	0	40.7	40.7	13.6	0
3°sputt.	55.7	44.3	0	0	32.8	50.8	13.1	0	36.6	39.7	17.5	0



CORROSION TESTS (MIG SAMPLES)



RESULT COMPARISON



REAL FIELD APPLICATIONS



PHARMACEUTICAL PIPELINES



REAL FIELD APPLICATIONS



PHARMACEUTICAL PIPELINES



REAL FIELD APPLICATIONS



PHARMACEUTICAL PIPELINES



REAL FIELD APPLICATIONS



PHARMACEUTICAL PIPELINES



REAL FIELD APPLICATIONS



WINERY VESSELS (VICENZA – ITALY)



REAL FIELD APPLICATIONS



WINERY VESSELS (VICENZA – ITALY)



REAL FIELD APPLICATIONS

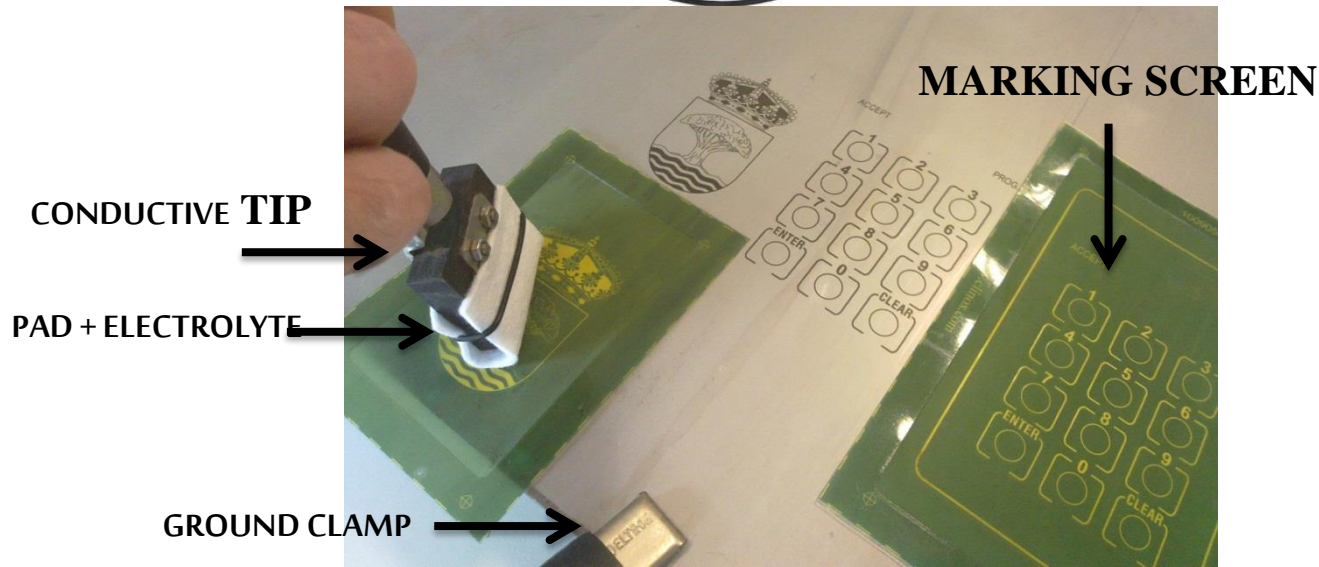


WINERY VESSELS (VICENZA – ITALY)

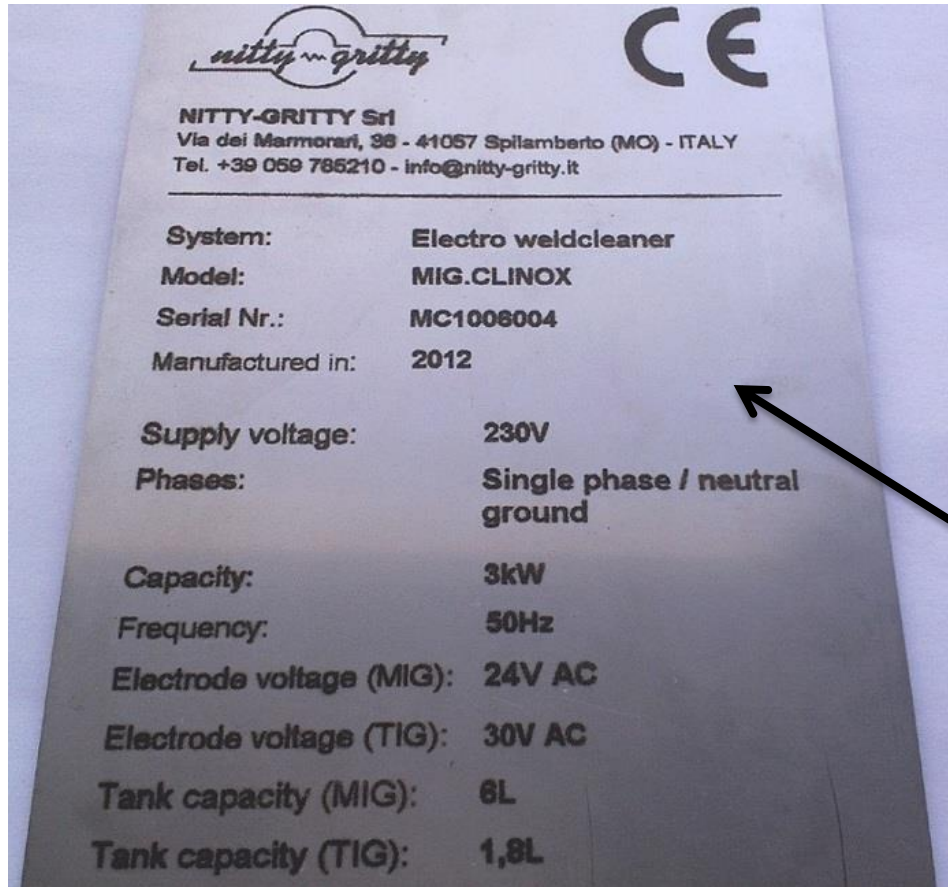


Inox Mark: Electrochemical marking

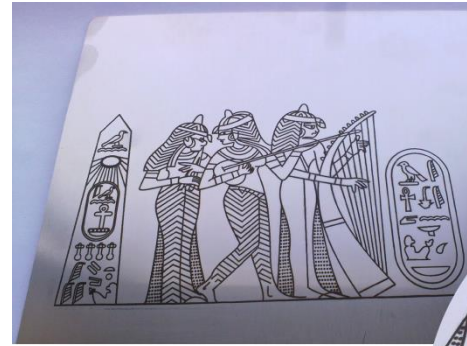
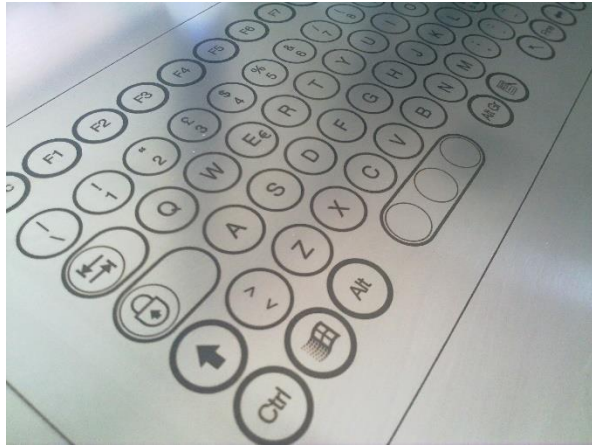
- ✓ HIGH CORROSION RESISTANCE
- ✓ HIGH WEAR RESISTANCE
- ✓ EASY TO USE
- ✓ LOWER PRICE THAN LASER PROCESS



Common uses: CE Plates / Barcode / QR code



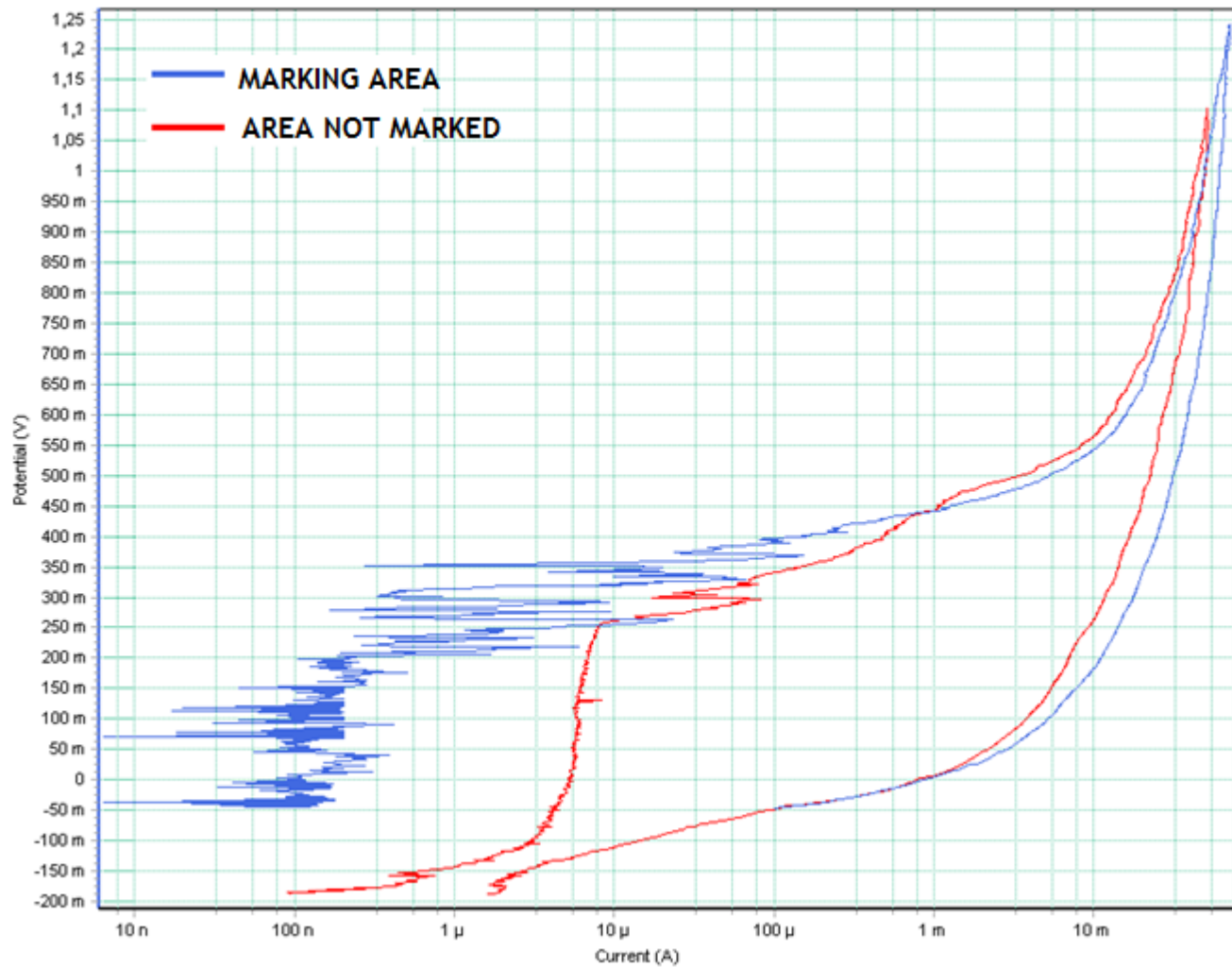
Graphical / Decorative Applications



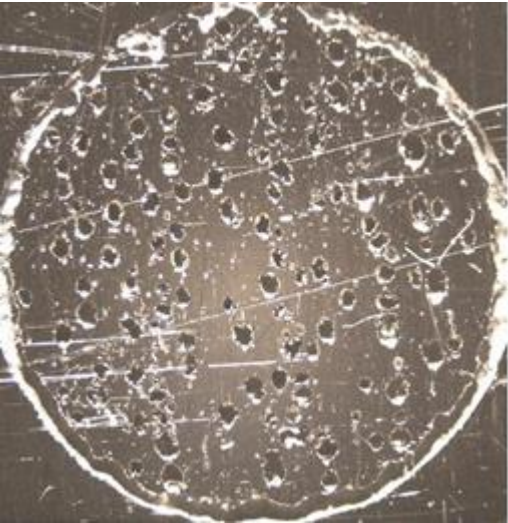
Logos / Symbols Applications



NaCl 3,5% Polarization Curves



CORROSION TEST

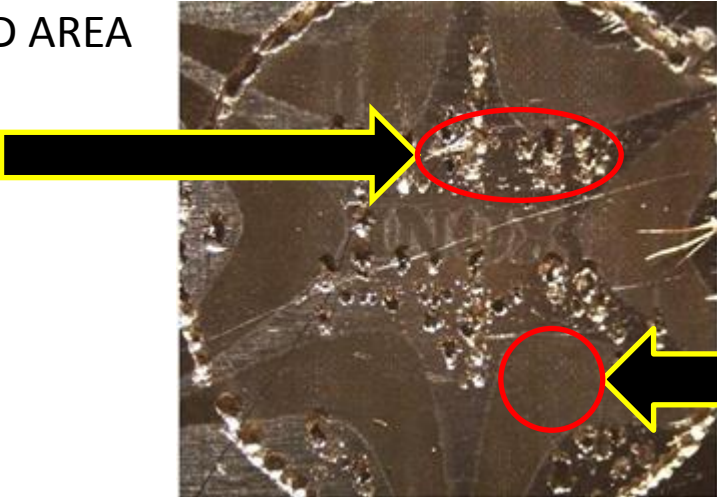


NOT MARKED AREA



MARKED AREA AISI 304

NOT MARKED AREA

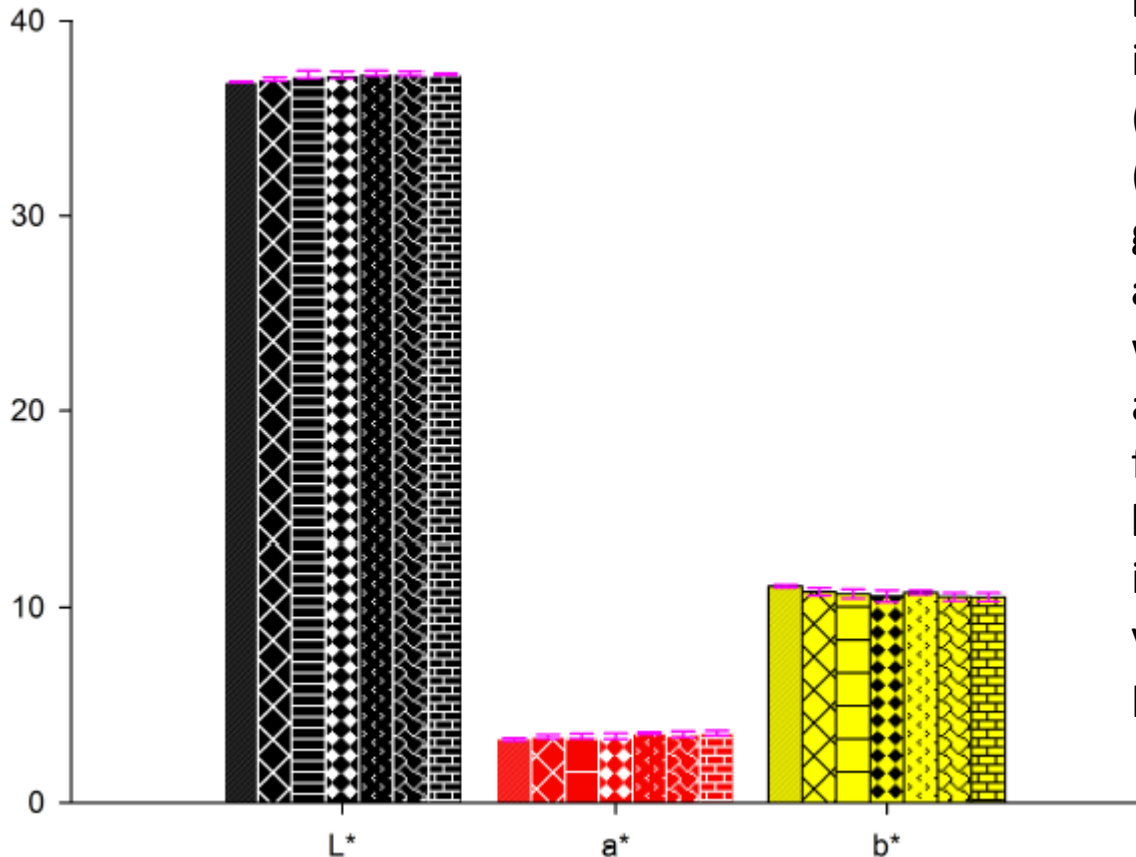


MARKED AREA

MARKED AREA AISI 430



COLOR ANALYSIS



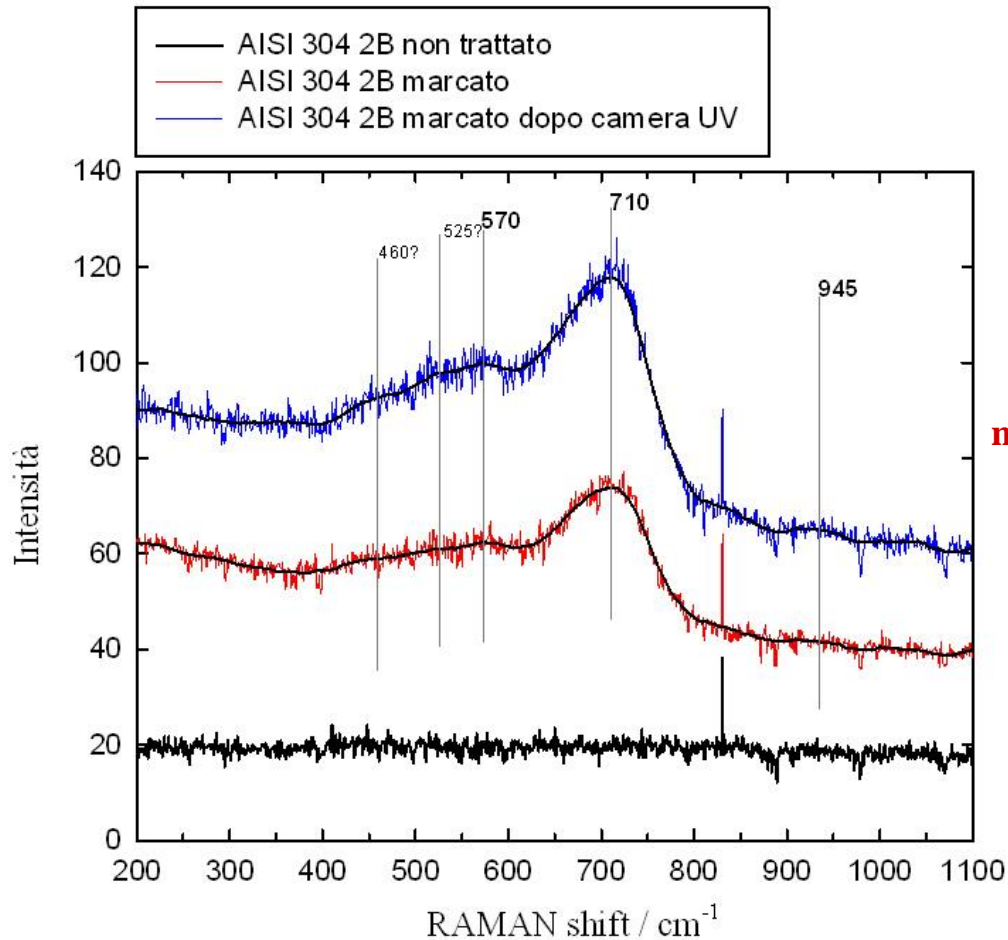
L*: represents the brightness, it can take values from 0 (corresponding black) to 100 (corresponding to white in the gray scale);

a*: expresses the red color when it is positive, It can assume values that ranging from 0 to plus infinity;

b*: expresses the yellow when it is positive, it can assume values that ranging from 0 to plus infinity.



RAMAN SPECTROSCOPY



Oxide	This work ^b	Ref. A ^c	Ref. B ^c
NiO	1074	1074 ¹⁶	
	910	913 ¹⁶	
	725	727 ¹⁶	
	532	535 ¹⁶	490 ¹⁶
	400	370 ¹⁶	
NiFe ₂ O ₄	702	705 ¹⁷	700 ¹⁸
	654 ¹⁹	655 ¹⁷	655 ¹⁸
	595	592 ¹⁷	
	574	570 ¹⁷	579 ¹⁸
	492	488 ¹⁷	490 ¹⁸
	460	457 ¹⁷	433 ¹⁸
Cr ₂ O ₃	610	613 ¹⁹	585 ¹⁹
	550	552 ¹⁹	554 ¹⁹
	528	527 ¹⁹	488 ¹⁹
	352	350 ¹⁹	387 ¹⁹
	302	300 ¹⁹	352 ¹⁹
NiCr ₂ O ₄	687	685 ¹⁷	686 ¹⁸
		616 ¹⁷	
		585 ¹⁷	
	550–560	554 ¹⁷	
	513	514 ¹⁷	512 ¹⁸
	429	430 ¹⁷	

REFERENCE: Ji Hyun Kim, Il Soon Hwang, Nuclear Engineering and Design 235 (2005) 1029-1040



BAGRATI CATHEDRAL – UNESCO W.C.H. SITE



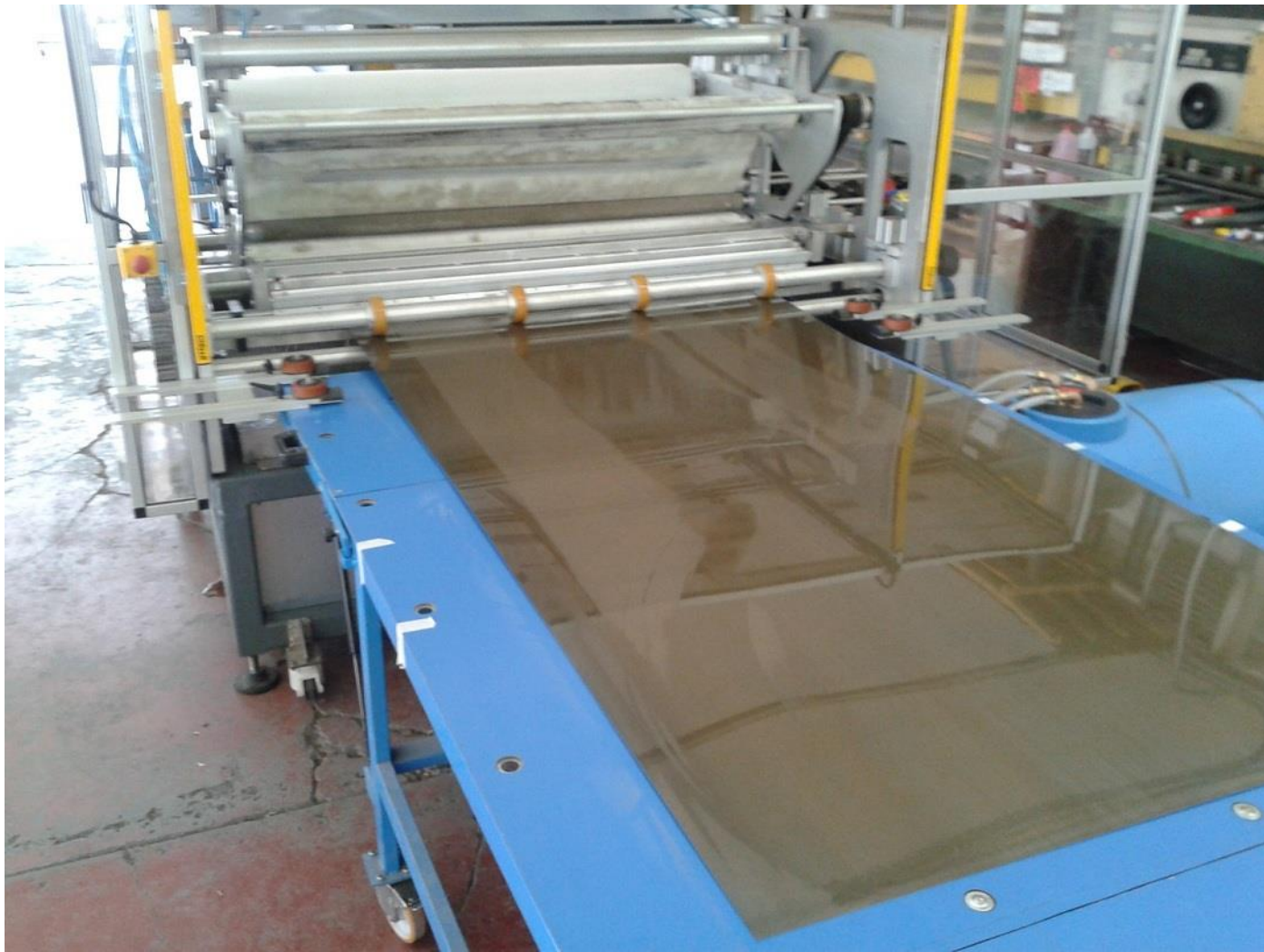
BAGRATI CATHEDRAL – UNESCO W.C.H. SITE



BAGRATI CATHEDRAL – UNESCO W.C.H. SITE



BAGRATI CATHEDRAL – UNESCO W.C.H. SITE



CONCLUSION

ELECTROCHEMICAL SYSTEM ALLOWS RAPIDLY AND EASILY TO TAKE CARE STAINLESS STEEL IN ORDER TO RETAIN THE ESTHETIC, RESTORING CORROSION RESISTANCE, DURABILITY AND MECHANICAL RESISTANCE OF STAINLESS STEEL



SSN

STOWARZYSZENIE
STAL NIERDZEWNA

THANK YOU FOR
YOUR ATTENTION



UNIVERSITÀ DEGLI STUDI
DI MODENA E REGGIO EMILIA

nitty gritty