

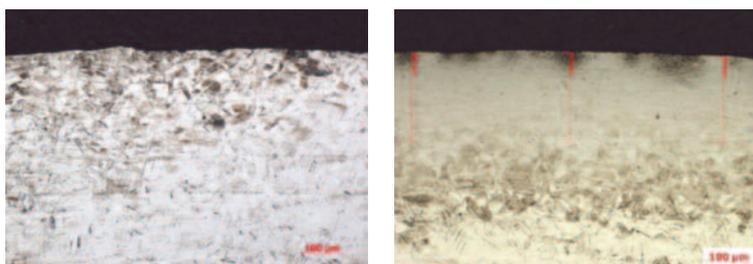
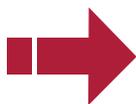
What is NanoPeening® ?

- >> NanoPeening® is a mechanical surface improvement technology developed and patented by Winoia
- >> Surface transformation of metals by reducing grain size down to a nanometric scale
- >> High level of properties never obtained (hardness, abrasive wear, fatigue, corrosion resistance,...) with a purely mechanical operation
- >> Available on an industrial scale



NanoPeening® effect

- >> Surface layer transformed into a nano-sized microstructure
- >> Surface hardness increased by 200%
- >> Stable Microstructure up to 600°C in steady regime
- >> Up to 200 µm transformed thickness
- >> Progressive transition from the surface to the core structure



Stainless Steel - 304 L (1.4307)

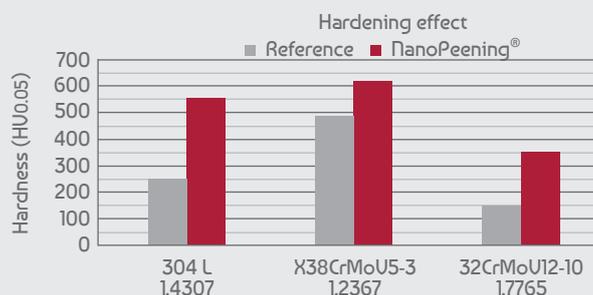
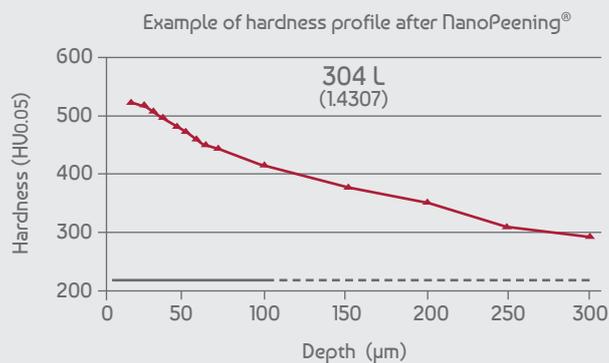
NanoPeening® is a purely mechanical treatment to deeply harden metallic surfaces

- >> No chemical involved
- >> No nanometric particles involved
- >> At room temperature

Main applications

- >> Tools (forging dies, casting dies, plastic molds, rolls...)
- >> Mechanical parts (gears & shafts, pistons,...)
- >> Stainless steel hardening (tubes, dosing pumps,...)

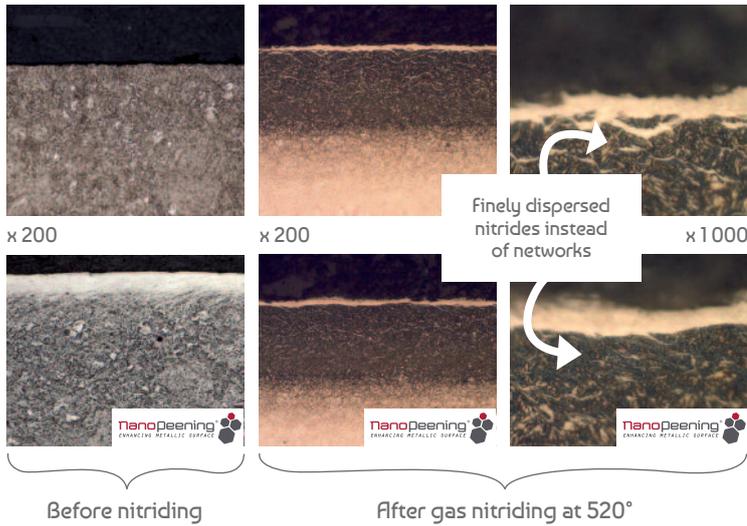
Grade	Treatment	Hardness on top surface (HU0.05)	Hardened layer (µm)
304L (1.4307)	Initial	220	
	NanoPeening®	540	+145% ~ 200
X38CrMoU5-3 (1.2367)	Initial	450	
	NanoPeening®	620	+38% ~ 60
32CrMoU12-10 (1.7765)	Initial	290	
	NanoPeening®	350	+21% ~ 90



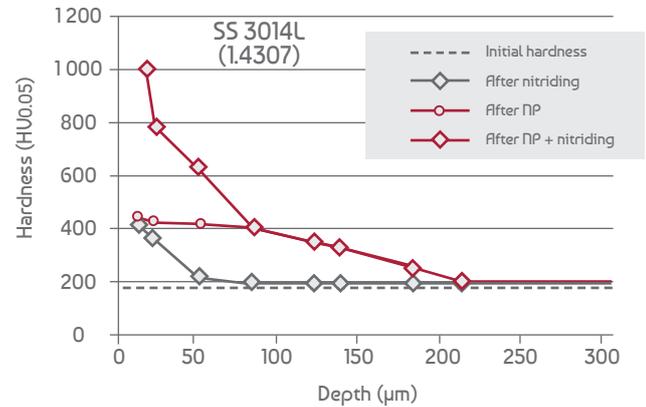
Combination with thermochemical treatment

- >> Higher hardening effect on the top surface
- >> Affected depth increase due to a better diffusion through more grain boundaries
- >> No more nitrides networks

X38CrMoU5-3



Example of hardness profile



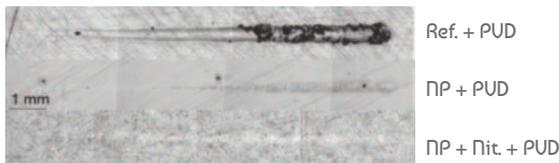
Grade	Treatment	Hardness on top surface (HV0.05)	Nitrided depth* (µm)
304L (1.4307)	Initial	220	-
	Nitriding**	430 +95%	40
	NP + Nitriding***	970 +340%	150 +275%
X38CrMoU5-3 (1.2367)	Initial	450	-
	Nitriding***	1295 +188%	145
	NP + Nitriding***	1380 +207%	170 +17%
32CrMoU12-10 (1.7765)	Initial	290	-
	Nitriding***	930 +221%	260
	NP + Nitriding***	980 +238%	260

* conventional nitrided depth: +100HV compared to core hardness
 ** gas nitriding 350°C/100h
 *** gas nitriding at 520°C

Combination with hard coatings

- >> Improvement of scratch resistance thanks to a higher substrate hardness
- >> Opportunity to achieve better properties

Scratch tests (5 to 200N, CW ball of 6mm diameter)



Grade	Treatment	Hardness before PVD (HV0.05)	Hardness with PVD* (HV0.01)
304L (1.4307)	Initial	220	1122
	NanoPeening®	540 +145%	1411
	NP + Nitriding	980 +345%	1753

* PVD CrN (3µm 1800 HV0.01)

Main benefits

NanoPeening, a solution for

- >> Reducing costs
- >> Increasing performance
- >> Downsizing mechanical parts
- >> Replacing thermochemical treatment when anticorrosion or treatment time issues

NanoPeening® at a glance

- >> Hardness increasing (up to 150%)
- >> Faster gas diffusion during thermochemical treatments such as nitriding
- >> More homogeneous top layer with less nitrides networks
- >> Better wear resistance