**Introduction:**

Improvement of nitrogen transport in surface nanocrystallized (NanoPeening®) during thermochemical treatments (gaseous nitridation) [1]:

→ increase the nitrided depth
→ decrease the nitriding temperature
→ increase in hardness and resistance to wear [2-3]

**Samples: Pure Iron**

EBSD after NanoPeening®

Oxygen depth profiles (GDOES)

NanoPeening®: adaptation of shot peening

→ severe plastic deformations (10-20 min)

**Nitriding kinetic studies**

Symmetric thermobalance (SETARAM TAG-24)

- Rising to the soaking temperature 500°C at 30°C C/min (He : 3 L/h).
- Isothermal reduction step (He : 3.875 L/h, H₂ : 0.125 L/h)
- Isothermal nitriding step (He : 2 L/h, N₂ : 1.4 L/h, NH₃ : 0.6 L/h) with different durations (from 60 to 210 minutes).
- Cooling at 30°C C/min He (3 L/h).

Mass gain and rate of mass gain for 1) untreated samples
2) short duration nanostructured 3) long duration nanostructured samples

**CONCLUSIONS**

- NanoPeening® improve nitrogen diffusion
- multiplying the number of grain boundaries which act as fast broadcast channels.
- Reduction improve nitriding efficiency
- increasing the specific reacting area
- Transfer the process on materials with alloying elements.

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**References**