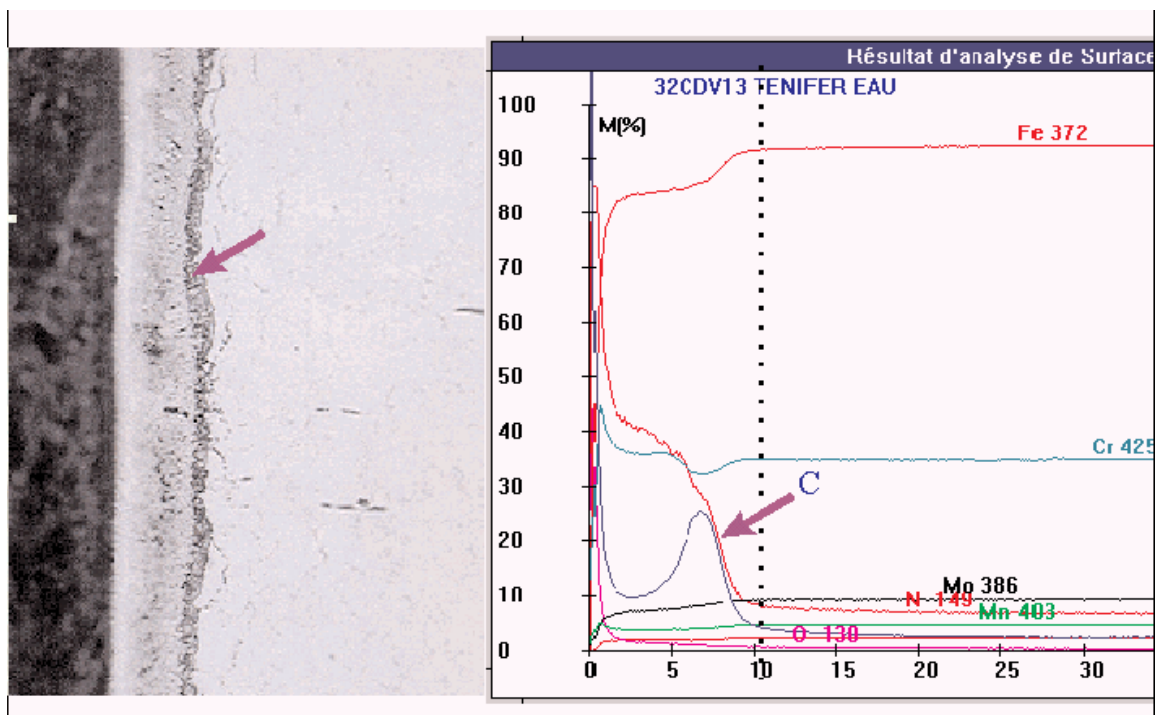


Thermal treatment on steel

Thermal treatments are used in many industries to improve the mechanical properties of steels. Amongst the most frequently used are: carbonitriding, carburising, nitriding and nitrocarburising. These different procedures are easily identified by RF-GD-OES.

Quantitative depth profiles, from 0 to about 150 μm , provide important information for monitoring the effectiveness of these treatments, on the segregation of elements in the steel and diffusion of elements from the gases in the controlled atmospheres used to treat the steels.



Nitriding: low alloy steel and steel grade 32CDV13

For nitriding, the oven atmosphere is composed of nitrogen, hydrogen and methane. It is therefore non-oxidising, and manganese does not segregate to the surface. In 'ionic' nitriding of low alloy steel, the nitride layer ('white layer') reaches a typical thickness of 5 μm . See Fig. 6.

In the nitriding of steel grade 32CDV13, electron microscopy and GD-OES both show the presence of a 10 μm thick 'white layer'. See Fig. 7. This is followed in the back-scattered electron image by a black band, which microprobe analysis indicates has high carburisation. The GD-OES quantitative depth profile shows that the carbon content in this layer is raised from 0.9% to 3%.

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