

How does plasma nitriding work?

ION HEAT tells you what happens to metal parts that are going to be nitrided under plasma. Briefly, the process consists of:

1

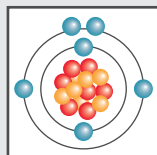
LOADING OF PARTS

The pieces are placed into a vacuum chamber which at the same time is a plasma reactor.

2

CREATION OF ATMOSPHERE

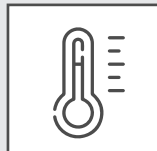
In the vacuum chamber: Generation of a controlled atmosphere, at low pressure, with nitrogen gas (N_2) and hydrogen gas (H_2) and the right mixture.



3

TAKING PARTS TO PROCESS TEMPERATURE

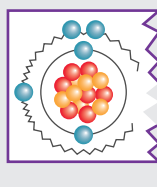
In the range of 350°C to 600°C (662°F to 1112°F), depending on the material and the expected results.



4

APPLYING AN ELECTRIC FIELD TO THE GAS MIXTURE (GENERATION OF PLASMA)

This electrical field ionizes the gas, that is, it breaks the H_2 and N_2 molecules, releasing high-energy nitrogen ions.



5

ION BOMBARDING

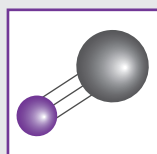
It is a chain reaction that involves the accelerated impact of positively charged nitrogen atoms (ions), which diffuse into the surface of the metal parts.



6

SURFACE REACTION AND LAYER FORMATION

The diffused atoms form nitride compounds with the alloying elements of the metal, mainly iron and other alloying elements nitrides.



Final hardness of the layer is highly dependent on the alloying elements present in steel. The main nitride forming elements are aluminum, titanium, vanadium, molybdenum and chromium.

Keywords

DIFFUSION

Is the movement of nitrogen atoms through the vacancies (crystal lattice imperfections) of the metal crystalline structure. Only extremely small atoms (C, H, N, and O) can move through these interstices.

IONIZED GAS

Refers to a state of gas where atoms have gained or lost electrons, creating ions. During plasma nitriding, ionized nitrogen gas (highly energetic) is obtained, which can diffuse into the surface of the metal part.

NITRIDE COMPOUNDS

When nitrogen atoms diffuse into the surface of the parts, they form strong chemical bonds with the alloying elements of the material and adopt compact crystalline structures (cubic or hexagonal), which hinder the movement of atoms and result in a high hardness layer.



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