



ELECTROLESS NICKEL HP PROCESS

INTRODUCTION

RRR pioneered the introduction of commercial electroless nickel plating in India way back in 1979. Over the years, it has perfected the chemistry and the technology of electroless nickel in order to make this process user- and eco-friendly.

All our Electroless Nickel processes are based on reduction by hypophosphite. The content of phosphorous in the deposit determines whether the electroless nickel coating is low-phosphorous, medium-phosphorous or high-phosphorous. The **Electroless Nickel HP Process** (HP = High Phosphorous) is described here in detail.

DEPOSIT PROPERTIES

The deposits are amorphous or fine-crystalline. Baking at more than 250°C for a certain duration of time leads to the formation of Ni₃P dispersion in a crystalline matrix of nickel. This also leads to an increase in the hardness of the coating. The deposits have high corrosion resistance and the bath has a high plating speed, which can range from 12.5 to 20 microns per hour. The process offers remarkable stability and is suitable for various applications. The deposits are bright and non-magnetic. The phosphorous content ranges between 10 to 12%. It is recommended to load jobs based on an area of between 1.6 to 2.5dm²/L of the bath volume.

As deposit material has a hardness of 500 to 600 HV 0.1. After heat treatment at 400°C for one hour, the hardness increases to between 900 to 1100 HV 0.1. The ductility is in the range of 1 to 2% and the density of the coating is between 7.8 to 8.1 gms/cc. The electrical resistance is between 60 and 90 micro ohms centimeter. The deposits are non-magnetic and might become slightly ferromagnetic after heat treatment.

BATH PREPARATION

The **Electroless Nickel HP Process** runs at a bath temperature of 88°C, with a working temperature range of 85 to 90°C. There are three components which make up the **Electroless Nickel HP Process** bath, namely,

ENP HP A (source of nickel ions)
ENP HP B (source of complexing and stabilizing agents) and
ENP HP C (source of reducing agent)

The nickel content is maintained ideally at 6g/L and the reducing agent at 40g/L. Bath agitation, mechanically or by air, is recommended. For barrel electroless nickel coating, air agitation is recommended.

Bath Preparation

ENP HP A	49 ml/L
ENP HP B	187 ml/L
pH	4.5
Working bath temperature	85 – 87 Deg C.

After adding the DI water to the clean tank, ENP HP B is added with stirring, followed by the addition of ENP HP A. Adjust the pH value to 4.5 (either with ammonia or 10% V/V sulphuric acid). Heat the solution to the operating temperature and adjust the pH again, if needed.

Please consult our technical staff before installation of a new bath.

While preparing a new bath upto 10% volume of the old bath can be added. Mechanical agitation is recommended during the process of deposition of the electroless nickel.

In the running bath, the ratio of added ENP HP A to ENP HP C must be 1:1. Depends on area and consumption.

PLATING EQUIPMENT & ACCESSORIES

Stainless steel tanks or FRP tanks with inner PP tanks are recommended. The SS tank should be anodically protected. Ducting is required, because the process involves the formation of hydrogen in the bath, which escapes as bubbles/mist. Continuous filtration is recommended, with a bath volume turnover of 10 per hour. For heating the bath, indirect heating is recommended, though immersion heating with passivated stainless steel is usually followed. Avoid local overheating of the bath, since the bath gets decomposed otherwise. Heat insulation of the tank is strongly recommended.

BATH ANALYSIS

Nickel is measured by complexometry and the reducing agent is measured by

iodometry. Please contact our lab for full analytical procedures.

EFFLUENT TREATMENT

Precipitation of nickel as hydroxide at high pH is carried out, followed by filtration. It is recommended to plate out as much of nickel as possible by electroless plating and then to subject the bath to effluent treatment. Please consult our lab for guidance. Please follow local municipal guidelines and rules for discharge of effluents.

Warranty: The above information has been given in good faith and based on our knowledge, information and experience. RRR has no control over the goods once it leaves our premises. All chemicals, including those which are not classified as hazardous, must be treated with proper care and all necessary precautions for handling and disposing of chemicals must be followed. No liability arises out of handling or use.

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