# The Effect of an Eco-friendly Additive on the Electrodeposition of Zn-Ni Alloy Coating for Application in the Automotive Industry

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## Abstract

Corrosion has been causing a big deal of damage over the years, both materially and economically. Not only does it waste raw materials and energy, it can also cause serious accidents and, in some cases, contribute to the pollution of the natural environment. Corrosion resistance is an important requirement for materials commonly used in many manufacturing industries and particularly in the automotive industry. Corrosion resistance is one of the basic standards of the automotive industry, particularly in harsh climates, as it can cause serious damage to vehicles. Among metal protection methods against corrosion, electroplating provides a smooth surface and a better bond between the particles and the metal substrate. Zn-Ni alloys have attracted considerable interest due to their ability to resist corrosion. Zn-Ni electroplating can be improved for a specific nickel composition in the Zn-Ni alloy compared with that of Zinc deposited alone, it can also be improved by adding various additives. The main objective of our research was to analyze how our eco-friendly additive influences the characteristics of the deposits obtained, in particular their morphology after electrodeposition, and their resistance against corrosion, using different concentrations of this additive (0g/l, 0.25g/l, 0.5 g/l, 1g/l). To this aim, several deposits were produced and their properties rigorously examined. The surface morphology of the deposits was analyzed by microscopy scanning electron microscopy (SEM), while energy dispersive spectroscopy (EDS) was carried out to assess the chemical composition of the deposits. Electrochemical impedance spectroscopy (EIS) was used to investigate the corrosion resistance of every deposition. The results show that the addition of the eco-friendly additive has a remarkable impact on the Morphology as well as the resistance against corrosion of Zn-Ni coatings, offering interesting prospects for improving protection processes in industrial applications, and paves the way for future studies on the use of food additives in electrochemical processes and on the mechanisms by which our additive influences metal deposits.

## Keywords

Zn-Ni Electrodeposition, Eco-friendly Additive, SEM/EDS, Corrosion Resistance, Metal Surface Protection, Automotive