

Effect of surfactant on the growth and corrosion resistance of Ni-P coatings on sintered Nd-Fe-B magnets

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Abstract Electroless deposited Ni-P coatings have been employed as protection coatings for sintered Nd-Fe-B magnets in industry due to their good corrosion resistance and mechanical properties. However, direct preparation of Ni-P coating on Nd-Fe-B suffers severe gas evolution, resulting in a coating with high porosity and uncompactness. In this work, the content of surfactant (sodium dodecyl sulfate, SDS) in the solution has been regulated to decrease the reaction rate and optimize the roughness of the Ni-P coating¹. The results of morphological characterization indicate that the crystalline state and the percentage of P is closely related with the dosage of SDS in the solution. With the concentration of SDS increase from 4 mM to 32 mM, the P content exhibit a volcanic trend with the maximum percentage of P (10.2%) appearing at the concentration of 20 mM. As mentioned previously, the percentage of P decided the crystalline of Ni-P coating, which in turn affect its corrosion resistance². Moreover, the regulation of P content also optimizes the compactness of the coatings. As a result, the corrosion resistance of Ni-P coated NdFeB magnets has been improved greatly in 3.5% NaCl solution.

Keywords Electroless deposition; Ni-P alloy; anion surfactant; corrosion resistance;

Reference

[1] Elansezhian, R.; Ramamoorthy, B.; Kesavan Nair, P., Effect of surfactants on the mechanical properties of electroless (Ni-P) coating. *Surface and Coatings Technology* **2008**, *203*, 709-712.

[2] Czagány, M.; Baumli, P.; Kaptay, G., The influence of the phosphorous content and heat treatment on the nano-micro-structure, thickness and micro-hardness of electroless Ni-P coatings on steel. *Applied Surface Science* **2017**, *423*, 160-169.