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Data Article

Data analysis and study of the influence of deposition power on the microstructural evolution and functionality of metallic phase composite coating

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ABSTRACT

In anticipation for resolution of deterioration catastrophe on metallic materials, researches in the field of corrosion remains. Zn–Ni–NbO_2 deposits were obtained on mild steel substrate using D.C. power source. The thermal stability properties of the coatings were determined by micro-hardness evaluations before and after heat treatment at 250 and 350 °C. The surface structure analysis was done by Scanning Electron Microscope and X-ray diffraction while the wear evaluations were obtained and compared. The weight gain and coating thickness were obtained and found to be in correlation with the wear results. The coating developed in this study is recommended for metallic surface improvement engineering applications.

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Subject area	*Materials Engineering*
More specific subject area	*Surface Science and Engineering*
Type of data	*Table, Figures*
How data was acquired	Electrodeposition process from an electrolyte bath containing the NbO_2 enhancing particle was done at a temperature of 35 °C. Prior to deposition the samples were mechanically and chemically prepared. The deposition voltage was varied between 0.5 and 10 V. The post plating analysis was done revealing the morphology structures through SEM/EDS and XRD. The effect of high temperature was explored at temperatures between 250 and 350 °C, average microhardness evaluations were utilised as stability indicators.
Data format	Raw, Analyzed
Experimental factors	Calibrated equipment was used in the process of obtaining the results to ensure precise and correct results data.
Experimental features	The deposited coatings were obtained from an electrolyte connected to DC power at 0.5 and 1.0 V for 20 min at a controlled temperature of 35 °C.The influence of the change in deposition applied voltage was investigated along with the additive composition variation.
Data source location	Department of Chemical, Metallurgical and Materials Engineering, Tshwane University of Technology, Pretoria, South Africa and Mechanical Engineering, Covenant University, Ota Ogun State, Nigeria
Data accessibility	Data are available within this article

Value of the data

- The resulting data will be useful for materials engineers by guiding them on the reaction of the formulated deposition electrolyte for a specific temperature application.
- The obtained data can be used to report on the relationship between the different variable in the study.
- The data is useful in providing a useful range of additive concentration enough for the improvement of the substrate material

1. Data

The depositions process was performed at 20 min at a voltage power supply variations between 0.5 and 1.0 V with temperature of 35 °C. The distance between the anode and cathode was kept constant while the NbO_2 enhancing additive composition was varies between a concentration of 10 and 15 wt%. The data for the formulation of bath framework is presented in Table 1. The coating thickness, weight gained, coating per unit area data were obtained after weighing the final mass and

Table 1
Summarized bath formulation (Zn–Ni–NbO_2 deposition).

Composition	Mass concentration (g/l)
$ZnSO_4$	150
Na_2SO_4	10
H_3BO_3	20
$(NH_4)_2SO_4$	20
Glycine	10
Nickel powder	60
NbO_2	10–15
Constant parameters	
pH	5
Voltage	0.5 V and 1.0 V
Time	20 min
Temperature	35 °C