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□□□□□□□

توجد عده طرق لتحسين خواص السطح للمعادن. ويتحقق ذلك إما بتغير التركيب الكيميائي لسطح المعدن بواسطة أضافه عناصر التسابك أو وبرفع صلادة سطح المعدن عن طريق تغيير بنيته المجهرية بواسطة المعالجات الحرارية المختلفة أوالصقل بالضغط ,ودلك لتحسين السطح النهائي, ورفع الصلادة المجهرية للسطح وزيادة مقاومه السطح للتآكل , وكذلك زيادة عمر الكلل الناتجة من تكون اجهادات الضغط المتبقية .

في هده الدراسة ثم تحسين نعومه السطح ورفع الصلادة السطحية المجهريه لسبيكة الالومينيوم (T361,2024) باستخدام أداة الصقل الاسطواني الداخلي, ثم استخدام اله بمميزات ميكانيكيه لقياس نعومه السطح بينما ثم استخدام مقياس الصلادة المجهريه بطريقه فيكرز للتعرف على التغير في المواصفات الميكانيكية للسطح المصقول واستخدام المجاهر الضوئية لتوصيف البنية المجهريه والتغير في حجم الحبيبات في البنية المجهريه ثم تحليلها ومناقشتها .

الهدف من هدا البحث هو إيجاد الظروف المثلى للصقل الاسطواني الداخلي , ودراسة تاثير المتغيرات على نعومه السطح والصلادة السطحية المجهرية والبنية المجهريه لسبيكة الالومنيوم (T361,2024) ودلك باستخدام عده صقل داخلي قطر 50 مم موديل DT5000 مدى تغيير (-0.2/+0.6) مم ثم صناعتها في الهند من شركه (DYNEMECH SYSTEMS PVT.LTD) وثم استخدام اله التفريز المبرمجة بتقنيه (CNC) موديل Bridgeport VMC500 وباستخدام طريقه Taguchi لتصميم عدد التجارب , ولتحليل تاثير كل متغير على خصائص الصقل الداخلي ولتوقع الخيار الأمثل لكل المتغيرات مثل سرعة الصقل وتغذيه الصقل و قطر الأداء و فى تحليل التباين (ANOVA) باستخدام اختبار F للتحقق من اى متغير الصقل الداخلي الموثر على خصائص الأداء وإيجاد النسبة المئوية لكل هده المتغيرات على نعومه السطح والصلادة السطحية المجهرية .

عموما وجد أن قطر الأداء توثر بشكل رئيسي على نعومه السطح بينما قطر الأداء وسرعة الصقل توثر بشكل ملحوظ على الصلادة السطحية المجهرية .

ABSTRACT

Several techniques can be used to improve surface properties of metals . These can involve changes on the surface chemical composition such as alloying or on the surface microstructure such as hardening or on the burnishing such as improved surface finish ,increased microhardness ,corrosion resistance and fatigue life as result of the produced compressive residual stress . In the present work surface was improved (surface roughness) and increased surface microhardness with a roller burnishing of aluminum alloys 2024,T361 .

Surface roughness characterization was done by an Surtonic3+Instrument ,mechanical features surface microhardness before, and after internal roller burnishing were evaluated by Vickers microhardness test ,and microstructure characterization was tested by an optical microscope ,grain size transformations (change microstructure) rapid solidification was then analyzed and discussed .

This research was aimed to determine the optimal setting of the process parameters on the internal roller burnishing and effect of working parameters on average roughness , surface microhardness and microstructure ,the aluminum alloys 2024,T361 was used as a workpiece . 50 diameter model DT5000 adjustment range (-0.2/+0.6mm) produced in north India by (DYNEMECH SYSTEMS PVT.LTD) was used as the internal roller burnishing tool. The experiments were done on an CNC milling machine model Bridgeport VMC500 by using Taguchi methodology .The Taguchi method is used to formulate the experimental layout and analyze the effect of each parameter on the burnishing characteristics, and to predict the optimal choice for each burnishing parameter such as burnishing speed, burnishing feed and tool diameter. Analysis of variance (ANOVA) used F-test to investigate which process parameters significantly affect the performance characteristics ,and the percent contribution of these parameters on surface roughness , surface microhardness and microstructure .

In general it is found that the tool diameter mainly affect the surface roughness ,while the tool diameter and burnishing speed significantly affects the surface microhardness from the microstructure there is notesable change in the surface integrity reported.

List of Abbreviation

AISI	American Iron And Steel Institute
RSSR	Russians
USSR	Soviet Union
SF	Self Feeding
MF	Machine Feeding
CNC	Computer Numerical Control
IAI	International Aluminium Institute
IADS	International Alloy Designation System
Mn	Manganese Mn
Si	Silicon
Mg	Magnesium
Cu	Copper
Zn	Zinc
Ni	Nickel
Ti	Titanium
Fe	Iron
Pb	Lead
Sn	Sink
P	Phosphorus
V	Vanadium

AL	Aluminum
HSS	High Speed Steel
G00	Linear Interpolation, Cartesian Coordinates, Rapid Traverse
G17	Working Plane:X/Y;Too axis:Z
G30	Min Point
G31	Max Point
G40	No Radius Compensation
G71	Millimeters (define at start of program)
G77	Circular Pocket Milling Clockwise
G83	Pecking
G90	Absolute Dimensions
M2	Stop Program
M3	Spindle ON Clockwise
M6	Tool Change
M99	Rapid To Retract Plane
T1	Tool No One
T2	Tool No Two
T3	Tool No Three
CLA	Center Line Average
Ra	Roughness Average
RSM	Response Surface Methodology
Rq	Root Mean Square Roughness
Rz	Average Maximum Height of Profile

Ry Maximum Height of The Profile

Sm Mean Spacing Of Profile Irregularities

ANOVA Analysis Of Variance

DOE Design Of Freedom

F-test Statistically Significant Process Parameters

OA Orthogonal Array

S/N Signal-To-Noise Ratio

SST Total Sum of Squares to Total Variation

H_B Brinell Hardness Number

H_{RC} Rockwell Hardness Cone

HV Vickers Hardness Test

HK Knoop Hardness Test

EDM Electrical Discharge Machine

µm Micrometer

ή The Estimated S/N Ratio Using The Optimal Level of The Process Parameters

rpm Revolution Per Minute

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