EuroSciCon

17th Edition of International Conference on

Emerging Trends in Materials Science and Nanotechnology

April 26-27, 2018
Rome, Italy

Rehab Hussein Khanjar, Nano Res Appl, Volume:4
DOI: 10.21767/2471-9838-C1-009

THE EFFECT OF LASER MELTING ON THE GRAY CAST IRON SURFACE ROUGHNESS

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The surface condition of a component is usually the most important engineering factor affecting its performance. Almost inevitably the outer surface of a workpiece is subjected to wear, fatigue and corrosion while it is in service. Average roughness (Ra) is important feature of the surface. It contributes slide wear, friction, corrosion, oxidation, fatigue, physical properties (optical, electrical, and thermal properties) and esthetic. Laser as a source of high concentrated heating energy was used successfully in surface treating of ferrous material products. Laser heating or melting induces phase transformation and structural changes, also low distortion with minimal disruption. These changes affect the surface roughness either negatively or positively that is depending on the processing set of parameters. Laser processing variables comprise that related to laser source (power intensity, operation mode and wavelength) and to the material (physical properties, surface absorptivity and geometry) in addition to laser scanning speed and shrouding gas flow rate. [8]. To avoid post processing and get preferred surface roughness the relation between laser parameters and surface roughness is to be investigated for a given material. Many researchers study the effect of laser cutting and heat treating parameters on surface roughness. In this work investigation of the effect of processing variables on the average surface roughness (Ra) of gray cast iron melted by CW diode-fiber Yb:YAG laser. Power intensity (I), time of interaction (t), and gas flow rate (g) were used as variables. It is found that for power intensities that maintain melting, decreasing time of interaction, increasing shrouding gas flow rate or increasing both of them led to increased average surface roughness. Table 1 represents the processing parameters via the resulted microhardness and the average surface roughness.

Recent Publications

1. Rehab H. Khanjar, Mohammed J. Khadhim and Adil Abbas Alwan, 2017. Experimental investigation of melting gray cast iron by laser. Journal of Material Science Engineering Volume 6 Issue 5(Suppl) pp 77.
2. Rehab H. Khanjar, " Analysis of gray cast iron microstructure and hardening by using Yb:YAG Laser", PhD Thesis series, University of technology/Baghdad.
3. Mohammed J. Kadhim Rehab H. Khanjar and Adil Abass Alwan. 2016. Performance evaluation of laser melting gray cast iron. , The First International Conference for Engineering Researches ICER(1-2/3/2017) Middle Technical University, Baghdad, Iraq.
4. Khayria Salman, Rehab H. Khanjar and Shada M. Rajaa, 2011. The Effect of Liquid Nitriding and Carborizing on Adhesive Wear resistance of carbon steel 1020. Engineering & Technology Journal V 29, essue 5, pp 231-240.

Sample No.	I (W/mm2)	t (s)	g (SLPM)	Ra (μm)	Hv kg/m²
1	44.45	0.66	0	1.63	280
2	62	1.32	10	1.24	811
3	81.15	0.76	20	3.13	652
4	84	0.96	5	1.2	626
5	117	0.48	20	1.83	601
6	134	0.096	10	4.99	694
7	187	0.19	0	4.45	792
8	215	0.15	20	4.46	859

Figure 1: Nano particles and their effect on yield and economics of B. juncea

Biography

Fifteen years of working research experience at National dairy Development Board, CAR C-NEH Region, Directorate of Rapeseed-Mustard Research and ICAR-Indian Agricultural Research Institute, New Delhi. Specialized in farming system research under hill and shifting cultivation for higher income, micro-irrigation and resource conservation technologies in mustard based cropping system. Handled externally funded and institute projects. Published >65 international and national research papers, ten bulletin, four extension folders, 15 book chapters and one book. Also handled 10 externally funded project including World Bank sponsored and 12 institutional projects.

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