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Experimental investigation of melting gray cast iron by laser

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Different researches had studied the effect of laser parameters on the depth of melt or on the hardness of different types of iron using CO₂ or Nd:YAG laser. In this research experimental investigation of the effect of laser melting of gray cast iron on the melted volume, the time to melt, the peak temperature, normalized temperature, also the relation between laser spot diameter and the melted track width. The work was carried out using a 600 W continuous wave Yb-YAG fiber laser under different parameters of laser, processing, and material, based on Taguchi L16B design of experiments. The variables are, laser power (80, 230, 380 and 530 W), traverse speed (2.5, 5, 10 and 20 mm/s), beam diameter (1.5, 1.9, 2.4 and 3.3 mm), surface roughness (0.203, 2.127, 3.623 and 5.363 μm) and shrouding gas (0.0, 5, 10 and 20 SLPM). Self-quenching and rapid solidification caused by laser melting altered deeply the cast iron structure. Structural changed volume is temperature and time dependent. It is important to find the volume of altered region, the peak temperature, normalized temperature, and time to melt for each case, then the relation between the experimental parameters and the measured features. The output of Taguchi design of experiments is described using different features which have direct effect on surface performance. Different equations were obtained that explain the relation between laser parameters and the geometrical dimensions, time to melt, peak temperature and normalized temperature, in addition the relation between laser spot diameter and the melted track.

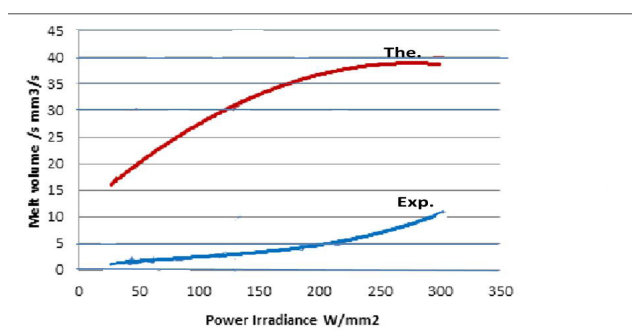


Figure1: Relations between power irradiance and volume of melt per unit time.

Biography

Rehab H Khanjar has experience as a Lecturer at the Institute of Technology for more than 20 years. She has done her Bachelor's degree from the University of Technology in Baghdad in Production and Metallurgy department. She has done her MSc in Extraction of Metals from University of Technology in Baghdad. She has done her PhD in Metallurgy and works as the Manager for Leetani Co., a company for general trading and engineering consultation for more than five years.

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