Abstract

This study investigates the fabrication of AA6061 reinforced with TiO2 as

a composite additive to modify its mechanical and microstructural

properties. Also, the die vibration , pouring angle, and TiO2 addition were

adopted as process parameters. Taguchi method with L3x3 array was used

as a design of experiment approach . The levels of process parameters were

and 100Hz) as the die vibration rates, (0, 5%, and10%) TiO2 , ٠،٥،١٠)) and

o , 90o). Optical microscope (OM), scanning electron microscope٤٥ ،٠

SEM) equipped with EDS, and X-ray diffractometer (XRD) were used to)

characterize the microstructure, chemical composition, and phase

composition of AA6061- TiO2 castings. Universal tensile test machine

UTM), impact test machine, and Vickers hardness test (HV) were used) to

evaluate the tensile strength, impact strength , and microhardness of

castings. The DOE approach analysis show that the most efficient

combination of casting parameters gave the highest ultimate tensile strength

and smallest grain size. The microstructure results showed that all castings

reveal the distinct dendritic structure with a decrease in grain size when

(increasing the die vibration . The smallest grain size was(57.32 µm

reported by the sample (S7) that prepared at the 100 Hz, 0°pouring ،angle

and 10 wt.% TiO2. SEM images showed that the regularity of dispersive

particles increase when increasing the vibration. XRD analysis showed a

decrease in the peaks intensity when increasing the die vibration and TiO2

addition. Also, the tensile test and microhardness of sample S7 were 142.2

MPa, and 85.67 Hv this evidently indicated that the adding of TiO2 and

increasing the die vibration improve the mechanical properties of the

.AA6061