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Material characterization and unconventional machining on synthesized Niobium metal matrix

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Abstract

The Purpose of this work is to develop a niobium based metal matrix alloy through sintering based powder metallurgy technique. The 2, 4 and 6 weight percentage of Titanium Carbide (TiC) is added to the alloy. Various material properties such as hardness, tensile strength, impact strength and density are measured after the addition of TiC particle. The characterization, microstructure and particle size of the developed metal matrix are learnt through Scanning Electron Microscope (SEM) and Energy Dispersive Analysis of x-rays (EDAX). Finally, the synthesized niobium metal matrix is machined by unconventional machining processes namely Ultrasonic Machining (USM) and Laser Beam Machining (LBM) processes. The various input and output parameters have been considered for this experimental work. The most influential parameters on Material Removal Rate (MRR) and Surface Roughness (SR) are found by Analysis of variance. The systematic evaluation of optimal parameters of MRR and SR are carried out by using taguchi approach.

Nomenclature

SEM	Scanning Electron Microscope
EDAX	Energy Dispersive Analysis of x-rays
TiC	Titanium Carbide
ANOVA	Analysis of Variance
USM	Ultrasonic machining process
MRR	Material Removal Rate
SR	Surface Roughness
BHN	Brinell hardness number
LBM	Laser Beam Machining

1. Introduction

In recent days, the gradual increase of research work associated to metal matrix is apparent because of the great demand of industrial needs. Due to high strength to weight ratio, metal matrixes are preferred in industrial applications. Normally, metal matrix composites are fabricated only by some alloying elements that are added to the base metal. The material properties can be enhanced when adding more alloying elements to the base metal.