A Project Report on

STUDY THE MICROSTRUCTURE AND MECHANICAL PROPERTIES OF GRAPHENE REINFORCED Cu5w COMPOSITE

A thesis submitted in the partial fulfillment of the requirement for the award for the degree of

BACHELOR OF TECHNOLOGY

IN

MECHANICAL ENGINEERING

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CERTIFICATE

This is to certify that project report is entitled "STUDY THE MICROSTUCTURE AND MECHANICAL PROPERTIES OF GRAPHENE REINFORCED Cu5w COMPOSITE" was carried out by **B.KALYAN KUMAR(17811A0305), B.VENUGOPAL(17811A0306), P.PAVAN KUMAR (16811A0357), T.VENKATA PAVAN KUMAR(17811A0359),** in partial fulfilment of requirements for the award of the degree of bachelor of technology in **"MECHANICAL ENGINEERING"** by Jawaharlal Nehru Technological university , Kakinada During the years 2017-2021.

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EXTERNAL EXAMINER

ABSTRACT

High conductivity of copper is exploited as an electrode material for Electrical Discharge Machining of conducting materials such as steel. However, the tool also wears out during the machining necessitating the use of composites to increased life. The composite electrodes, in general, are prepared using powder metallurgical technology.

In the present investigations, hot pressing manufacturing process is employed to fabricate possible electrodes in copper-tungsten, copper-tungsten–graphene with varying amounts of 0.5, 1.5 and 2.5 wt%. Typically, all the necessary powders were milled for 60 min in tungsten carbide vessel with tungsten carbide grinding media. The powders were consolidated in a graphite die with graphite punches for 4 min at 900^{O} C into bars of 10 mm square cross-sections and 55 mm length at a pressure 30 kg/cm^2. The densities and hardness of the hot-pressed bars were measured using the Archimedes method, micro Vickers methods respectively. 10 mm cubic samples were cut from the bars and were brazed to pure copper rods and tested for their suitability as electrode materials for Electrical Discharge Machining on AISI D3 steel.

The observed results are correlated with the density, hardness, and composition. It was found that the densities of more than 90% were obtained for all the compositions with increased additions resulting in increased hardness. Both Tool Removal Rates and Material Removal Rates were observed to be increased. However, the surface finish can be tailored by a suitable combination of composition and microstructure.

The optimized results indicate that the tool with composition copper with 5wt.% tungsten and 0.5 wt% graphene to have a better overall performance with high Material Removal Rate and moderately low Tool Removal Rate and comparable surface roughness that can be an alternative to a copper tool made using hot pressing.