The following major conclusions have been arrived at from this study,

- Aluminium has a good affinity in accepting dispersoids with increasing proportions and thereby improving the mechanical properties such as
  i. Wear resistance
  ii. Hardness
  iii. Tensile and compression properties
  iv. Machining properties

Silicon carbide dispersoids offer excellent wear resistance and hardness properties when incorporated into the base matrix aluminium alloy.

- Stir casting and powder metallurgy routes could be successfully employed to fabricate metal matrix composites and hybrid materials with improved mechanical properties.

The specimens produced by stir casting offer better wear resistance than the powder metallurgy specimens. This may be due to the formation of pores during sintering operation in the powder metallurgy process, which paves way for crack formation and propagation. It can be seen that the tensile property of the specimens prepared by powder metallurgy is less than the liquid metallurgy specimens. This is because of the good interfacial bonding of the cast specimens. Also the specimens fabricated by liquid metallurgy are harder than the specimens prepared by powder metallurgy. This is due to
the fact that liquid metallurgy specimens have closer interfacial bonding and higher strength.

- A fairly uniform microstructure with little porosity is obtained in two different routes. Specimens prepared by powder metallurgy show fine dispersion of reinforcements in the matrix. The cryo-treated specimens show a stable microstructure.

- Increasing the volume % of SiC reinforcements results in an increase in tensile, compression, wear resistance and hardness of the composite.

- Cryogenic treatment of the composite specimens produces significant improvement in the hardness, wear and compression properties of the composite.

- The composite specimens could be easily machined by electrical discharge machining and modeling of the machining responses, the material removal rate, tool wear rate and surface roughness are done.

The process variables chosen for electric discharge machining categorized as material variables (volume % of reinforcement, grid size of particulates, compacting pressure during powder metallurgy process, specimen treatment temperature and treatment time) and the machining variables (current, pulse duration), play a significant role in deciding the nature of responses namely material removal rate, tool wear rate and surface roughness.

Metal matrix composites represent a wide range of materials, which includes cermets and metallic foams, as well as more conventional particle and fiber-reinforced metals. Techniques employed for production of metal matrix composite material and
components depend on the types of matrix and reinforcement concerned. These are classified according to whether the matrix is in the liquid, solid or gaseous state when it is combined with the reinforcement. Each of these processing routes has advantages and disadvantages. In particular, some are far more expensive than others. The lowest cost routes are generally those in which particle-reinforced aluminium is produced using liquid metal handling, particularly stir-casting. Material produced in this way represents a substantial proportion of the MMC’s in commercial use today. Other materials and processes have, however, also gained importance recently. It is likely that, as MMC applications continue to expand, the spectrum of materials and processes employed will remain relatively wide.

There is a need to develop inexpensive technique capable of producing large sizes and complex shapes of MMC’s so that they can be economically useful for industrial applications. Stir casting and powder metallurgy are low cost commercially proven techniques for practical metallic composite fabrication of near net shape composite components, and are expected to open up new market opportunity for the metal industry.