Experimental Analysis of Tool Coating on HSS as a base metal.

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ABSTRACT

This paper describes the coefficient of friction evaluation of Tin coated tool during the sliding wear. This hard Tin coating by applying composite method of cathode arc and magnetron sputtering, the hard Tin coating was prepared on bearing steel. The various parameters which are microstructure, micro hardness, micro scratch and tribological properties of such coatings were studied for analyzing the relationship between coefficient of friction and other properties. It was found that, the friction and wear of coating which are two interactive responses from the tribological systems affected each other and should be consider as a single phenomenon. Hence, the study is carried out for evolution of coefficient of friction and wear life can be estimated using new friction model.

Keyword: - *Tribological properties, antioxidation properties.*

1. INTRODUCTION

The coatings which are hard being mostly used in different fields due to their properties of high hardness, good chemical stability, wear resistance and antioxidation capability which may be high speed machining and metal forming industries. In this at elevated temperatures with heavy cyclic loading, the coated tool experience the unavoidable service impact for better understanding of the responses of various coatings which has great importance not only for prediction of various properties but also for research and development of advance coatings.In the studies of these coatings, the coatings on either one side or both sides. Four major parameters are kept in mind thickness of coating, hardness ratio, size of surface roughness, hardness of debris at contact. In which another properties also characterised certain tribological properties which are roughness, ductility, hardness, strength, oxide film. The main parameter also studied which is coefficient of friction. It describes the contact between different bodies and varies due to the wear.

2. TYPES OF COATINGS

2.1 Ceramic Coating: The ceramics has many excellent properties such as the wear resistance, thermal resistance, corrosion resistance and they come to be applied widely in these fields. However, the form of the work to coat was restricted, because the machining after coating is very difficult, while ceramic coating has many advantages.Because of this reason, it becomes possible to make the unique composite material that combines the excellent advantage of the base material and ceramics by Coating of the ceramics.It becomes possible to improve tool performance, friction performance and life more substantially by the reduction of wear resistance, friction coefficient in comparison with the conventional Coating materials by applying such ceramic coating to the tools, metallic molds and machine parts.

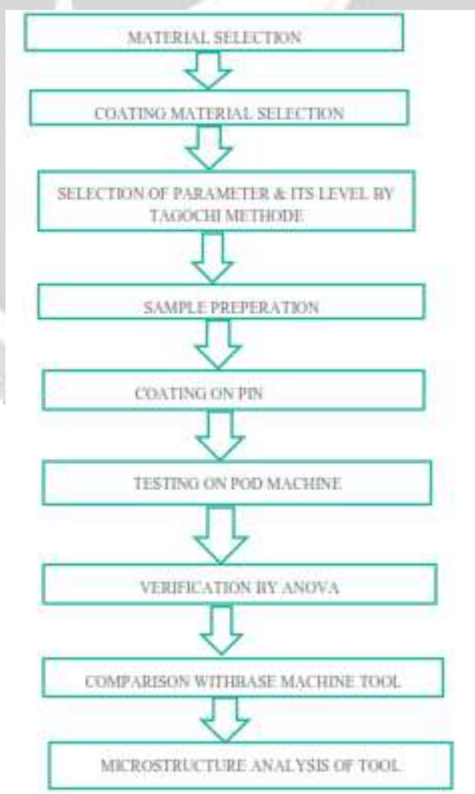
2.2 **TiN, TiCN, TiAlN Coatings:** We offer Titanium Nitride (TiN), Titanium Carbonitride (TiCN), and Titanium Aluminum Nitride (TiAlN) Coatings on all our cutting tools. These coatings, when applied to the appropriate tool for a given application, will accomplish some or all of the following: 1) increase tool life, 2) reduce down time, 3) allow increased feed and speed rates, and 4) reduce tooling costs per job/piece. In general, coated cutting tools offer substantial cost reductions.The above noted coating benefits may be diminished due to: 1) an incorrect tool choice, 2) an incorrect coating choice, 3) the parts material, 4) the machine tools rigidity, 5) the spindle and/or tool holder(s) run out, and 6) the type and feed of coolant, if any.

3. PHYSICS AND CHEMISTRY OF COATINGS

Methods of x-ray analysis, mass-spectrometry and probing diagnostics have been used to investigate physical parameters and processes occurring in a mixed gas-metal low temperature nonequilibrium plasma of different composition. It is shown that under given conditions the maximum achievable ionization of metallic vapors (up to 100 %) and high plasma-energy parameters provide for a defect-free strong cohesion of coatings with base materials and result in the formation of assigned structure and properties of coatings with coating thickness reaching 10 to 100 microns.It is found that, in conditions of slowed adatomic two-dimensional migration and in the absence of kinetic slow-down of metal-metalloid reactions in localized regions of the surface layer, the condensate forms the structures of amorphous and microcrystal types. This process is also accompanied by the formation of strongly supersaturated solid solutions and metastable phases, absent in equilibrium diagrams.It is shown that the polyenergetic multiphase ion flow, generated by a plasma source, allows to carry out multipurpose technologies of ion implantation at significant depths in order to modify the material surfaces. It has found application to increase the corrosion resistance of materials.

As a result of researches, a number of ecologically clean technologies of coating deposition at low temperatures have been introduced into certain engineering and consumer domains (strengthening of cutting tools and machine components, anticorrosive and protective-decorative coatings, thick-coated molding-type products, high-temperature protective coatings, etc.). For realization of these technologies special installations BULAT, AIR, YANTAR’, POTOK, BAZAL'T and others are designed and constructed.

4. METHODOLOGY



5. EQUIPMENT VIEW

The weight of the pins, both coated and uncoated are measured. Then the pin is clamped in the support. Before that the disc was fixed in the rotor which is coupled with motor via belt drive pulley. Then the load is applied against the pin supported beam. The pin on disc equipment has a computer based controller, used to control the parameters of the pin on disc apparatus. The parameters required are speed in rpm and load in Kg. Based on the parameters the system will generate the values of coefficient of friction and values of frictional force for the given time period in the interval of 1 minute.

Fig 1. Pin on Disc Equipment

6. CONCLUSION

In this review article, current development on fabrication, microstructural characterization and mechanical property evaluation of mmcs with zircon reinforcement have been dis- cussed. With regard to processing of zircon reinforced mmcs,a review of available literature shows that these processing techniques can be classified as casting (stir casting, squeeze casting, compocasting), solid state processing (powder metallurgy) and semi- solid processing (spray deposition). Among these processes, the stir casting process is extensively adopted because of its simplicity, flexibility and low cost for the fabrication of large size components. Though this method offers several advantages, it leads to porosity in the fabricated composites. However, composites produced by squeeze casting, compocasting and powder metallurgy exhibit lesser porosity compared to the composites produced by stir casting technique. Spray forming technique, though advantageous in producing a dense near net shape product, is limited to small sized components. Microstructural evaluation showed the uniform distribution of zircon particles in the metal matrix, as well as strong bonding between the particle and matrix at the interface .mechanical properties such as hardness, abrasive wear resistance, elastic modulus and tensile strength were reported to improve with the dispersions of zircon particles. In particular, the abrasive wear resistance of the composite was found to improve significantly with increase in amount of zircon as well as a decrease in the size of zircon particles. In conclusion, considering from technical and economic factors, zircon particles appear to be promising reinforcement especially for aluminium metal matrix composite.

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