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# "A STUDY ON BEHAVIOUR OF COMPOSITE COATINGS MATERIAL"

***Dr. Vinay kumar Chaudhary***

*Asst Prof. Department of Physics , Nalanda College of Engineering ,Gokhulpur, Bihar, India*

## ABSTRACT

***The coating types included in this paper cover a broad range of coatings composition, deposition conditions, and measurements. The particles are utilized to perform explicit mechanical, electrical, piezoelectric or attractive properties in slight coatings. The point of giving a covering to a substrate is to improve a portion of its properties of the substrate or to acquire a totally new property. The composite covering innovation is utilized many assembling regions. Composites are multifunctional materials having remarkable mechanical and physical properties that can be modified to meet the necessities of a specific application. Present day innovation goes for frameworks performing palatably under extraordinary working conditions .as of late, electroplating has risen as an actually and monetarily feasible union course to deliver nanostructure metals, amalgams and composite materials both in mass structure and as covering of different thicknesses. This valuable process can coat not only electrically conductive materials including graphite but also fabrics, insulators like plastics, rubber etc. The low coating rates with these can provide better reflectivity of plated surfaces and many more applications. Coatings can be tailored for desired properties by selecting the composition of the coating alloy/composite/metallic to suit specific requirements. The market for these coatings is expanding fast as the potential applications are on the rise.***

***Keyword:*** *Metal matrix, composite coatings, Material properties, Electrode position, Co-deposition, Micro technology*

## I. INTRODUCTION

Corrosion of materials is a serious problem because it causes undesirable changes in construction materials and consequently economic problems. These undesirable changes can often be prevented by the use of appropriate surface treatment. One possible treatment is the application of different type of coating. The most common and most frequently used electrodeposited coatings are zinc coating and alloy coatings based on zinc. These coatings represent approximately one quarter of all surface treatments. This is caused mainly by simple technology of their production and their good corrosion resistance. Recently other properties have become very important, e.g. low friction coefficient, etc. These requirements can be met by the application of multilayer coatings, but the layer thickness growth and technology is complicated. One possible solution is the application of the coatings with incorporated particles improving the friction properties, i.e. composite coatings. Composite coatings are used in various fields of industries such as general mechanics and automobiles, electronic components and computers etc. The deposition of finely dispersed particles of PTFE (polytetrafluoroethylene) in a metal matrix by electro deposition led to a new generation of composite coatings. These composite coatings show particular physical and chemical properties, which can not be achieved by each component separately. The most desired properties are better wear resistance, selflubrication, abrasion resistance, and corrosion resistance [1-8]. These depend mainly on used particles (graphite, diamond, MoS2 or PTFE) and type of solution (pH, temperature, bath, etc.), but also on the size, concentration, distribution, and morphology of the particles.

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## II. COMPOSITE COATINGS

Electrodeposited composite coatings consist of a metal matrix with either a ceramic or cermet particle addition which represents the new development in the field of coating processes. Electro-composite coating is a co-deposition of a homogeneously dispersed second phase material on the surface of the substance material with the form of a particulate material, whisker, and fibre in a metal matrix with enhanced or new engineering properties. Inert particles such as diamond, powdered ceramics (for example aluminum oxide, silicon nitride and silicon carbide) or polytetrafluoroethylene (PTFE or Teflon) can be deposited on the nickel matrix, forming a composite.

In general deposition of a metal occurs on a substrate surface by the reduction of metal ions in solution. If the reduction is brought out by electrical energy than the process is called Electroplating. In conventional electroplating, insoluble suspended impurity particles present in electrolyte has been entrapped / co deposited with the metal deposition on the substrate. This resulted in greater outcome on the end property of the deposition. In formation of electrodeposited composite coatings, the similar method of mechanical entrapment of suspended insoluble particles is used but under strictly controlled conditions. In formation of electrodeposited composite coating, the insoluble particles are dispersed in a conventional electroplating bath. The dispersed particles can be metallic or ceramic. During the electrolysis, the insoluble particles are trapped by the metal ion during its reduction from the cathode and a composite deposit is formed. The particles are held in suspension by mechanical agitation. Electroplating process which are readily amenable to composite electrodeposition are those which operate at high cathode efficiency. The main two factors governing the particle entry into the metal matrix are the presence of a gas stream and the particle size.

Various types of wear resistant electro-composite coating are,

- Ni-SiC Electro-Composite Coating
- Ni-diamond Electro-Composite Coating
- Ni – Al2O3Electro-Composite Coating etc.

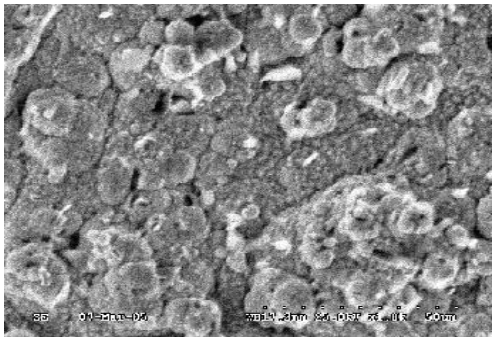

***Fig.1*** *SEM image of SiC Composite Coating*

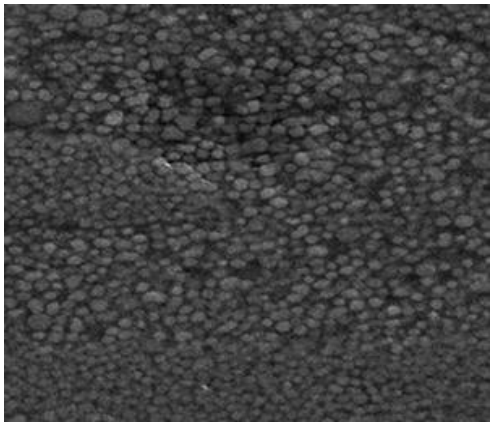

***Fig.2*** *SEM image of Zirconia Composite Coating*

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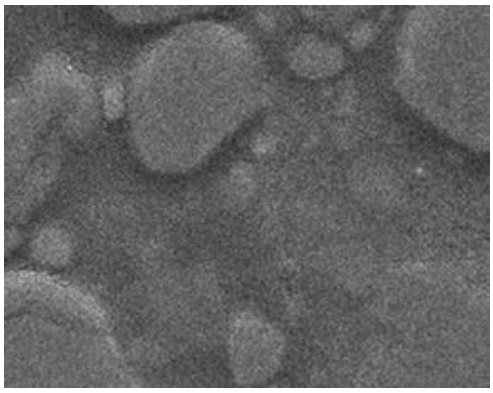

***Fig.3*** *SEM image ofAlumina Composite Coating*

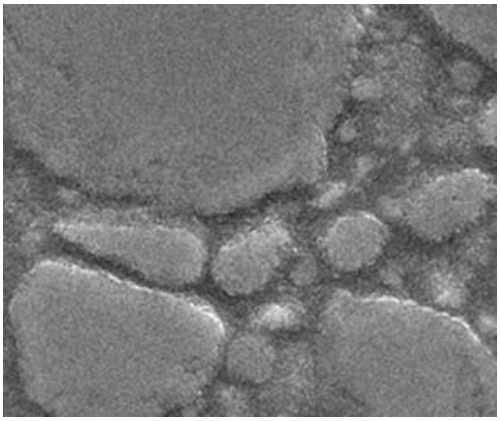

***Fig.4*** *SEM image of Titanium Oxide Composite Coating*

The use of ceramic particles in a metal matrix has long been used as a means of achieving tough, dispersion hardened coatings For example, a major impact of composite plated coatings has traditionally been in automotive engines for wear resistance and improved lubrication, where Ni-SiC and Ni-PTFE are both accepted coating options, e.g. in high performance internal combustion cylinder liners such as those used in prestige road cars or competitive automotive sports cars and motorcycles. A more specialist use has been in wear resistant tool facings, where competition exists from thin vacuum deposited layers, such as Co-WC and Ni-TiN ones. Surviliene and co-workers at Vilnius University have examined the effect of SiC on the corrosion behaviour of 10 mm thick chromium coatings electroplated from a hexavalent bath containing 10 g dm23 SiC, making extensive use of electrochemical impedance spectroscopy at the corrosion potential 0.1M H2SO4z Na2SO4, the composite coatings showed a much lower corrosion rate than a chromium plated layer, as evidenced by their increased charge transfer impedance (i.e., larger semicircles) especially in the case of hybrid Ni-WC-SiC composite coatings deposited from baths containing higher particle concentrations.

## III. LITERATURE SURVEY

Clint and Michael have reported that surface coatings have gained great reputation over the past several years and are prevalent in a more number of industries which include aerospace, automobile, computer, machining and precision manufacturing industries [1]. Hagedorn and Weinert mentioned that metal matrix composites (MMCs) are very commonly used to combine low structural weight with high wear resistances in the component development of automobiles. As a matrix work piece material as aluminium or magnesium is used because of their low density,reasonable mechanical strength and super hard fibers or particles made of silicium carbide ,aluminium oxide or titanium dibroide[2]. Kılıc kap et al has found that aluminium, titanium and magnesium alloy can be used as metal matrix element and the accepted reinforcements are silicon carbide (SiC) and alumina ($Al_2O_3$). Aluminium-based SiC particle reinforced MMC materials are used for many Engineering applications because of their properties such as less weight, heat-resistant, wear-resistant and low cost [3]. Hui et al explained that a brush plated alloy Ni–Fe–W–S coating

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having a corrosion resistance is greater than that of electrodeposited chromium and a superior wear resistance than that of electrodeposited chromium at high speed and heavy load under normal conditions where lubricant was applied between the contact surfaces. [4].

## IV. CONCLUSION

Surface Engineering is the modification of surfaces for a variety of reasons such as to enhance the corrosion resistance, decrease wear or to provide electrical or thermal insulation. Improvement in material properties is inevitable in order to meet the advanced engineering applications. Electrodeposition of composite coatings plays a remarkable role to obtain desired physical properties in the metal matrix composites. This article deals with some work of the earlier investigators on electrodeposited composite coatings has been reviewed, that can be used for characterization of coatings for micro technology applications. Details about these, and indeed about all the information's presented in this article, are available in the literature. It is nevertheless hoped that this article serves as a preliminary introduction for electrodeposited composite coatings.

## REFERENCES

1. Clint morrow and Michael lovell,"Numerical contact analysis of Transversely isotropic coatings", Wear, Vol.236, 1999, pp.360-367.
2. M.Hagedorn, and K. Weinert, "Manufacturing of composite workpieces with rolling tools", Journal of materials processing technology, Vol.153–154, 2004, pp. 323-329.
3. E. Kılıc¸kap , O.C. akır , M.Aksoy, and A.Inan, "Study of tool wear and surface roughness in machining of homogenized SiC-p reinforced aluminium metal matrix composite", Journal of materials processing technology , Vol .164–165, 2005, pp. 862-867.
4. Xu Jianga, Wenjin Liu, ShiYun Dong, and BinShi Xu,"High temperature tribology behaviors of brush plated Ni–W–Co/SiC composite coating", Surface and coatings technology , Vol .194, 2005, pp. 10 – 15.
5. K.H. Hou, M.D. Ger, L.M. Wang, and S.T. Ke, "The wear behaviour of electro-codeposited Ni–SiC composites", Wear, Vol. 253, 2002, pp. 994–1003.
6. V. Medeliene,"The influence of B4C and SiC additions on the morphological", physical, chemical and corrosion properties of Ni coatings, Surface and Coatings Technology, Vol. 154, 2002, pp. 104–111.
7. Hongzhi Wang, Suwei yao and Sowjum matsumura, "Electrochemical preparation and characterization of Ni/SiC gradient deposit", Journal of materials processing technology, Vol. 145, 2004, pp. 299-302.
8. Kezheng Sang, and Zhihao Jin, Unlubricated friction of reaction-sintered silicon carbide and its composite with nickel, Wear, Vol. 246, 2000, pp. 34–39.