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Copper Plating on ABS plastic

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Abstract - *Rapid advancement in technology and polymer chemistry ABS (acrylonitrile-butadine-styrene) plastic is at a stage of replacing metals parts due to its quality of cost effective ,light weight easy to mold so good in aesthetic and design etc. Main problem is its non conductivity because metals are very good conductor of heat and electricity. Plastic is strengthen enough so we done etching on it to make it conductive with a environment friendly etching process as direct electroplating is not easy without any adhesion. So in this paper coating on plastics is discussed below as earlier graphite plating with some adhesion was done. Now a days due to advancement in industry and material we prefer the copper plating on ABS plastic.*

***Key Words*: ABS Plastic, Polypropylene, POP, Electroless nickel, HCl ,Copper, etching, Pd/Sn activating solution**

1.INTRODUCTION

ABS stands for acrylonitrile-butadine-styrene contain almost negligible corrosion and erosion with high strength to weight ratio.Because of some advantages industry are using plating on plastics and advantageous reasons are as after plating no buffing or deflashing is required as well low weight, low cost and its ability to mold aesthetically.No. of plastic material are being plated now a days in the industry as Polypropylene, Polysulfone , ABS ,Polyetherimide,Teflon and so on but ABS is calculated best electroplating plastic among them because of some other influencing factor like low coefficient of thermal expansion,erase modeling,good aesthetics,high adhesion to substrate etc Rapid advancement in the technology gives rise to replacement of metal with plastics in a no of applications with lots of influencing factor as discussed above. Commercially electroplating was introduced in Europe and after that in North America with limited breakthrough in ABS (acrylonitrile-butadiene-styrene) was a good adhesion material between ABS and coating material. Automobile industry was eagerly waiting for POP (plating on plastics) because despite of low cost and low weight which makes an automobile fuel efficient aesthetic appeal of a product increase in market.

2. Reported work

Plating on plastics is a term used to illustrate the decorative or useful application of metal onto plastic substrates using the process of electroplating as on ABS. Before plastics can be electroplated they first need to be metalized. This is achieved by etching the surface (to provide a strong bond) and coating the roughened surface with traces of a precious metal. This precious metal provides the 'seeds' for deposited of a thin layer of nickel or copper by electroless deposition.

Etching is achieved in a sturdily acidic solution to which special wetter's to reduce surface tension are added. The acid is neutralized, before the precious metal is laid onto the surface. Typically nickel is used at the electroless stage. However when large components are plated, copper is recommended due to its higher conductivity. Nickel and chromium metals are the most commonly applied, normally called 'chrome plating' or 'plastic chrome plating'. This finish provides both technical and aesthetic benefits and can be applied to meet many different application criteria. For example, highly noticeable and corrosion resistant exterior automotive components are often chrome plated plastics, providing a lower weight option compared to traditional metal components. Plastic chrome plating is also ideal for sanitary fittings that require a durable and wear resistant coating to resist the humid bathroom environment. Before electroplating started on ABS material some process involve as cleansing ,etching and activation.

Cleansing is a process of removing each and every particle of dust from ABS. Etching is a process of providing roughened surface which is useful for adhesion and coating Activation of etched surface is to provide catalyst for chemical deposition. Earlier polypropylene used for plating due to some problems it demise even adhesion quality was excellent that is high coefficient of thermal expension,notch sensitivity which makes it brittle and sink. Even though crack may be filled with soft plastics but it loses strength also so it replaced by ABS in coming time. ABS is widely used in a range of application due to its quality as modeling is possible in a selected part,as modeling is necessary part of any design so certain designing feature must be in mind of a designer before making ABS conductive as filler presented in a hidden area to improve the aesthetic quality,no welded joint in a integral part, no visible sink mark with the help of ribs and bosses ,textured the surface in a manner that no scratch is visible.

3. Procedure

These are some steps followed to do electroplating on any plastics

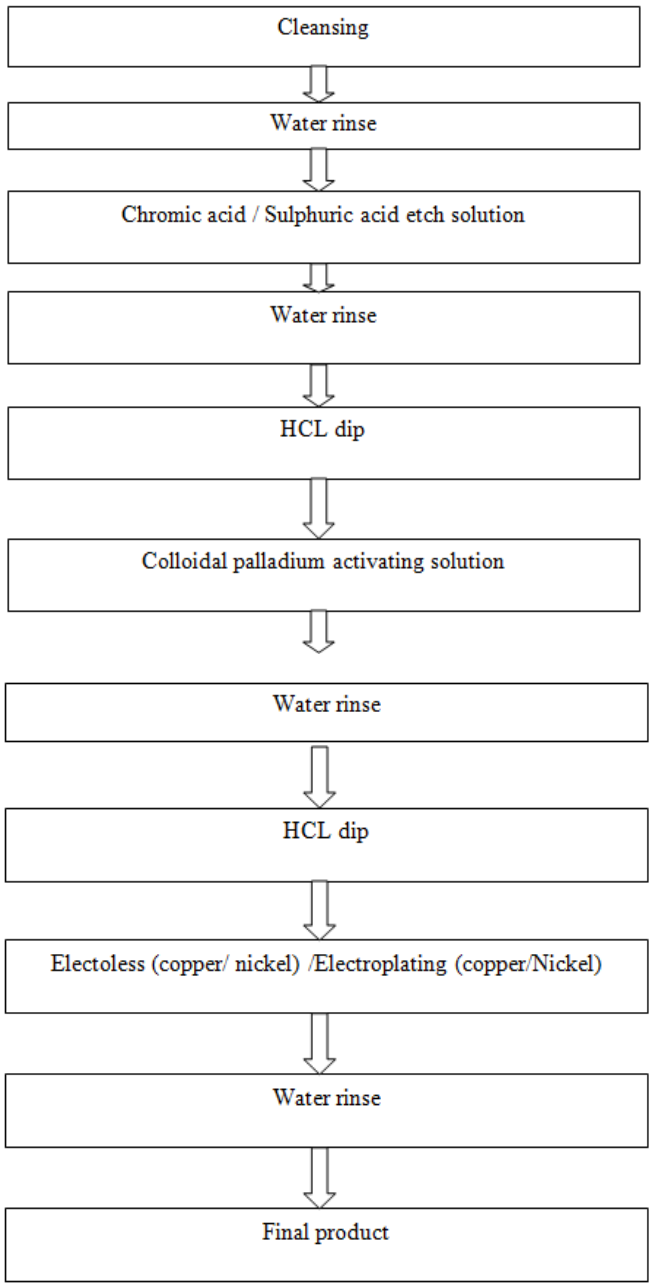

Fig -1: Procedure followed while doing electroplating

These are simple cleansing and water rinse process despite of these composition is mainly important in electroplating because every material need different composition with different parameters .some composition being used in electroplating process are discussed as follows

1.Chromic acid/ sulphuric acid etch solution	Conc.sulphuric acid :- 180ml/l Chromic acid :- 430gm/l Trivalent chromium :- 40gm/l Temp.:-60-65° Immersion time :- 3 to 10 minutes
2.Dilute HCl dip	180 ml/l
3. Colloidal palladium activating solution	Palladium Chloride ($PdCl_2$) :-0.007gm/l Stannous chloride ($SnCl_2$) :-35 gm/l Stannic chloride ($SnCl_4$):- 4gm/l Conc.HCl :-500gm/l Temperature:-25-30°C Immersion time :- 3 to 6 minutes
4. Dilute HCl dip	180ml/l
5.Electoless copper	Copper salt :- 1.8 gm/l Rochelle salt :- 25 gm/l Formaldehyde:- 10 gm/l Sodium Hydroxide:- 5gm/l 2Mercaptobenzothiazole :- 2 gm/l

Table -1: Composition of Electroplating Process on ABS plastics

3. CONCLUSIONS

This paper concluded that ABS like plastics are low weight, cost effective and aesthetically improved design. The above process is eco friendly so no negative impact on

environment. This increases demand of ABS in industry especially in automobile industry

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