Physical and Chemical properties of Polyaniline

Samala Sai and Anil Kumar

School of Chemical Engineering and Physical Sciences, Lovely Professional University, Phagwara, 144411, India

Abstract

PANI is not simply ruined by the normal conditions of the weather like temperature and moisture,. The PANI protective coating agents shows remarkable enhancement of weathering resistance. PANI acknowledged as the corrosion inhibitor. The chemical stability of the PANI is good, when PANI is doped either with the acids or bases. PANI has wide applications and used in both electronic and optical devices such as fuel cells, sensors and Light emitting diodes (LEDs).

Keywords: Polyaniline, Physical, Chemical, Properties

1.0 Introduction

To prepare the polyaniline of two types we use the solvent once and other in the absence of the solvent, in a vacuum oven the synthesized polyaniline is dried, distinct morphologies will be observed. Chemical oxidative polymerization process is used for the synthesis of the polyaniline. Here we use scanning electron microscopy, Fourier transforms infrared spectroscopy and X-ray diffraction is utilised for the characterisation. It's not difficult to prepare the polyaniline. It can be obtained at a certain price which is low. Properties of the Electrical and optical are shown by the polyaniline and its environmental stability is good. In devices of optical as well in electronics it is used examples like fuel cells, transistors, light emitting diodes and electronic circuit boards. Granular morphology has been noticed in the absence of solvent, whereas fibrillar and granular morphology has been noticed when we use the solvent for the preparation of polyaniline. For the samples the electrometer is used for measuring the electrical conductivity. Through dynamic as well as with the static light scattering measurements, we can observe the polymerization, identification of aggregates takes place. The identified aggregates having the structure of rod and shape like spherical this tends to give the morphology of bulk nanofibrillar polyaniline [3].Properties of thermal are exhibited by the polymers which are conducting. Polyaniline shows physical properties, chemical properties, thermal properties and mechanical properties. Factors like ratio of oxidant to monomer concentration, utilisation of dopant nature as well as the temperature are very important for the exhibition of electrical conductivity by the polymers which are intrinsically conducting. In the last decade polyaniline.It is widely studied and has attracted many in the previous decade because of the presence of the NH- groups in its polymer chains, Electrical conductivity, chemical and Environmental stability. Enzymatic polymerization is one of the methods for the synthesis of the polyaniline (PANI) used by Zemel and Quinn **[4]**.

We have so many other methods for the chemical synthesis of the polyaniline nano-fibers such as the interfacial polymerization, non-template polymerization, surfactant assisted polymerization, nano-fiber

seeding, oligomer-assisted polymerization. Polyaniline (PANI) microtubes were synthesised by the template polymerization, by using this method required shape of the material was obtained. But it is a long process to remove the template and there are chances of destroying the polymer **[5].** Polyaniline system is prone to the fibrillar growth as compared with the other conducting polymer systems like polypyrrole, polythiophene. It has been observed that under dilute conditions, if peroxydisulfate oxidant is added all at a time that leads to the formation of the nano-fibers, but granular polyaniline is formed when we add peroxydisulfate oxidant dropwise. Photopolymerization is also another method for the synthesis of the polyaniline composite. In this it was noticed that morphology of the conducting polymer relies on the excitation wavelength. Polyaniline can also be synthesised by the chemical way, in this method there is mixing of mixing of monomer with the oxidizing agent will takes place in an aqueous, non-aqueous or acidic media **[6].**

2.0 Properties

2.1 Physical properties

Normally polyaniline present in the form of powder polyaniline color changes which rely on the distinct oxidation states. The pernigraniline state which is completely oxidized shows violet color, whereas the partially reduced as well as partially oxidized emeraldine base shows blue color. However, the salt of emeraldine which is acid doped also conducting shows color of green. The capability in the variations of color relies upon the redox states, in which electrochromic applications **[7]** are appropriately determined.

2.2 Mechanical properties

If the polyaniline present in the form of powder then there is obstruction of its applications in the deposited layer or in the filler layer. Usually the mechanical properties are examined for the composites of polyaniline filled polymer, electro spun fibers depend on the distinct core materials. There are insufficient literature works are available on the polyaniline mechanical properties. Excellent mechanical strength shown by the compressed polyaniline powder pallet. Valentova'a et al. **[8]** examined that the pallets are being synthesized by the compression of the polyaniline powder and compared with the PS.

2.3 Thermal properties

Multiple phase degradation shown by the polyaniline at the elevated temperatures. The different degradation phases are caused by moisture loss, dopant loss, main chain degradation and eventually by the bound water loss. Structures of the dopant's effects degradation performance. Thermal stability improvement can be achieved at a particular temperature range this happens when we utilize the dopants combination at a time. Attempts made to examine the polyaniline glass transition temperature (Tg), in which it is found that for uncross linked polyaniline Tg=70°C and for the cross linked Tg=250°C **[9].**

2.4 Chemical properties

The chemical stability of the polyaniline is good, when polyaniline is doped either with the acids or bases, properties of electrical and electrochemical of the polyaniline changes. At the processes of doping and dedoping the polymer main chain do not involve in the chemical reaction. For that reaction polyaniline shows good chemical and resistance towards the acidic and basic solutions where it does not go through any

type of chemical reaction or chemical degradation. Anyhow at elevated temperature cross links are formed **[10]**.

Conclusion

By the SEM characterization we can able to know what type of morphology that the samples show or exhibit either they show mixed morphology that is granular and fibrillar or shows only single morphology whether fibrillar or granular. We can also compare the electrical conductivity of dual morphology with the singular morphology then we come to know which is having the high electrical conductivity. The reduction in the polyaniline conductivity can also be known with the solvent as well as with the without solvent. We examined that the polyaniline which was synthesized using without solvent has less crystallinity as compared to the polyaniline which was synthesized using with solvent. Polyaniline is not simply degraded by the normal conditions of the weather such moisture, temperature and other. The polyaniline protective coating agents shows remarkable enhancement of weathering resistance. Polyaniline is acknowledged as the corrosion inhibitor. The chemical stability of the polyaniline is good, when polyaniline is doped either with the acids or bases. polyaniline has wide applications and used in both electronic and optical devices such as Light emitting diodes, sensors and fuel cells. It is also used in Electronic circuit boards and transistors. Polyaniline nanofibers shows the electrical and mechanical properties.

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