SYNTHESIS AND CHARACTERIZATION BIOPOLYMERS

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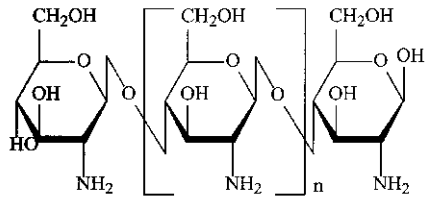
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Abstract- Chitosan is a well sought after polysaccharide in biomedical applications and has been blended with various macromolecules to mitigate undesirable properties. Polycaprolactone (PCL) is a biodegradable polyester with a low melting point(around 60 degree C) and the glass transition temperature of about -60 C. The work deals with the preparation and characterization of the chitosan and poly ε caprolactone (PCL) solution casted blended films in various properties (chitosan – pcl ratios are 90:10, 75:25, 60:40).The casted films were characterized based on the structural Functions, optical and electrical studies by using X-Ray Diffraction, Fourier Transform Infra Red, Ultra Violet visible spectrometer and LCR meter.

I. INTRODUCTION

Chitosan is prepared from chitin with the help of three steps namely deproteinization,demineralization and decolorozation.PCL is a versitile synthetic polymer with low melting point of 60˚.It is also a biocompatible and biodegradable polymer like chitosan .It has a neutral charge distribution and it has been blended with various amorphous crystalline and polymers including chitosan.

Chitosan:

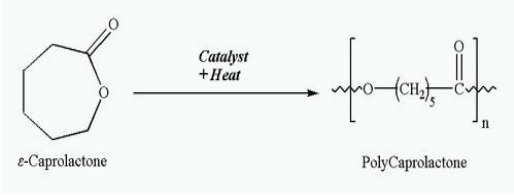


Chitosan

Chitosan is a linear polysaccharide composed of randomly distributed β-(1-4)-linked D-glucosamine (deacetylated unit) and N-acetyl-D-glucosamine (acetylated unit). It has a number of commercial and possible biomedical uses.

Polycaprolactone:

Polycaprolactone (PCL) is a biodegradable polyester with a low melting point of around 60°C and a glass transition temperature of about −60°C. PCL is prepared by ring opening polymerization of ε-caprolactone using a catalyst such as stannous octanoate. The most common use of Polycaprolactone is in the manufacture of speciality Polyurethanes. Polycaprolactones impart good water, oil, solvent and chlorine resistance to the polyurethane produced.



This polymer is often used as an additive for resins to improve their processing characteristics and their end use properties (e.g., impact resistance). Being compatible with a range of other materials, PCL can be mixed with starch to lower its cost and increase biodegradability or it can be added as a polymeric plasticizer to PVC. Polycaprolactone is also used for splinting, modeling, and as a feedstock for prototyping systems such as a RepRap, where it is used for Fused Filament Fabrication (similar to the Stratasys' Fused Deposition Modeling or FDM technique).

EXPERIMENTAL:

Blending two polymer in an effective way to develop new materials with combinations of properties not processed by individual polymers. The wide range of physical, chemical properties and processibilities and biological interactions of natural polymers. Since the properties of pcl and chitosan are complementary. It is possible that blending two polymers will give composite owning properties of idea; scaffold such as biocompatibility. Biodegradability and t to promote he ability tissue development. The blending of chitosan with pcl has been investigated not only for medical applications and also is an effective to reduce environmental pollution from plastic waste.

Selection of common solvent: Chitosan is insoluble in water organic solvents. Some organic acids such as acetic acid ,formic, lactic and oxalic acids are frequently used for dissolution .Pcl dissolves in organic solvents such as chloroform ,acetic acid and not in water.Chitosan dissolves in acetic acid but not in many organic solvents.Chitosan and pcl were blended homogeneously in a unique solvent mixture of acetic acid .

Preparation of stack acidic acid solution: 10 ml of glacial acetic acid dissolves in 100ml of distilled water is known as stack acidic acid solution.

Preparation of 0.1 NaOH solution: 0.4gms of NaOH dissolves in 200 ml of distilled water is known as 0.1 NaOH solution.

Preparation of chitosan solution: Stack acetic acid solution is added with 2wt% chitosan powder to produce chitosan solution for the blend.

Preparation of PCL solution: The PCL solution prepared by 1.8% PCL added with glacial acetic acid.

Preparation of film:

. The polymer solution are mixed with a definite ratios like (60:40),(75:25),(90:10) in a20ml to form blend solution. That blend solutions are kept in a Petri dish and placed in a magnetic stirrer for 4 hours with the heat of 55˚c .Then 0.1M NaOH solution dripped out on the polymer film o remove the amine groups in the chitosan and avoid depolymerization.Finally the Petri dish were kept in the desiccator to obtain the polymer films and kept till further study.

RESULTS

FTIR studies:

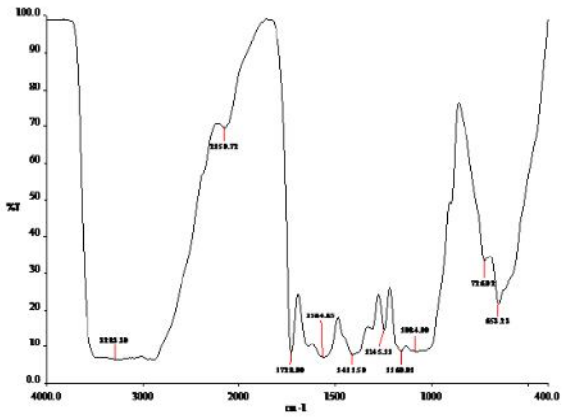
3000-3600cm^{-1}has broad OH stretching

3200-3700 cm-1 is the more intensity due to NH group of chitosan.

1722(1725)cm^{-1} has carbonyl groups stretching vibration in pcl

1650cm^{-1} has stretching of amide !

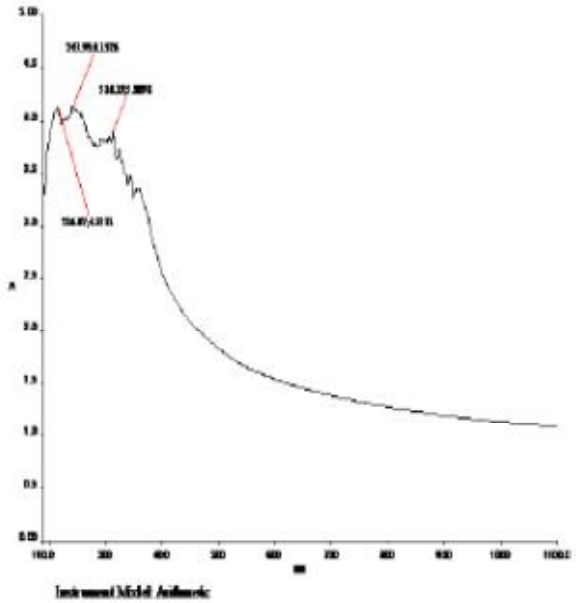
1590 cm^{-1} has amine deformation in the chitosan 732 due to pcl.

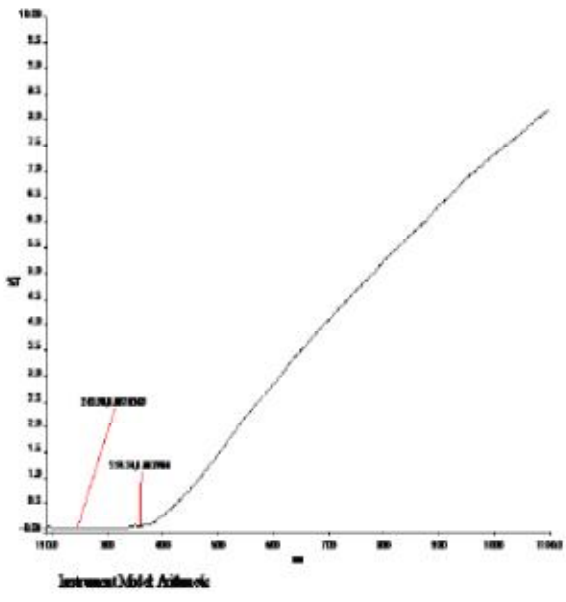


FTIR spectrum of blend film indicated a shift in peak absorption from 1744 to 1728(75:25)&1724 (60:40) due to carbonyl group respetively. The peak absorption due to 732 of pcl representing –c=o rocking has shifted lower wavelength 726cm^{-1}(75-25) &733(60:40)in the blended films. This shift in absorption peak indicates the miscibility interaction of tmo polymers. These peaks are also present in the ftir spectra of chitisan/pcl.blends,although with varying intensities depending of their composition. The higher absorption intensity of 3200-3700 cm^{-1} in curve chitosan/pcl(60:40)indicates that there is more in chitosan/pcl. The border absorption peak of 3000-3700 cm^{-1} in curve chitosan/pcl (60:40)indicates that the bonds are weaker than the chitosan/pcl(75:25) .

UV VISIBLE SPECTROCOPY:

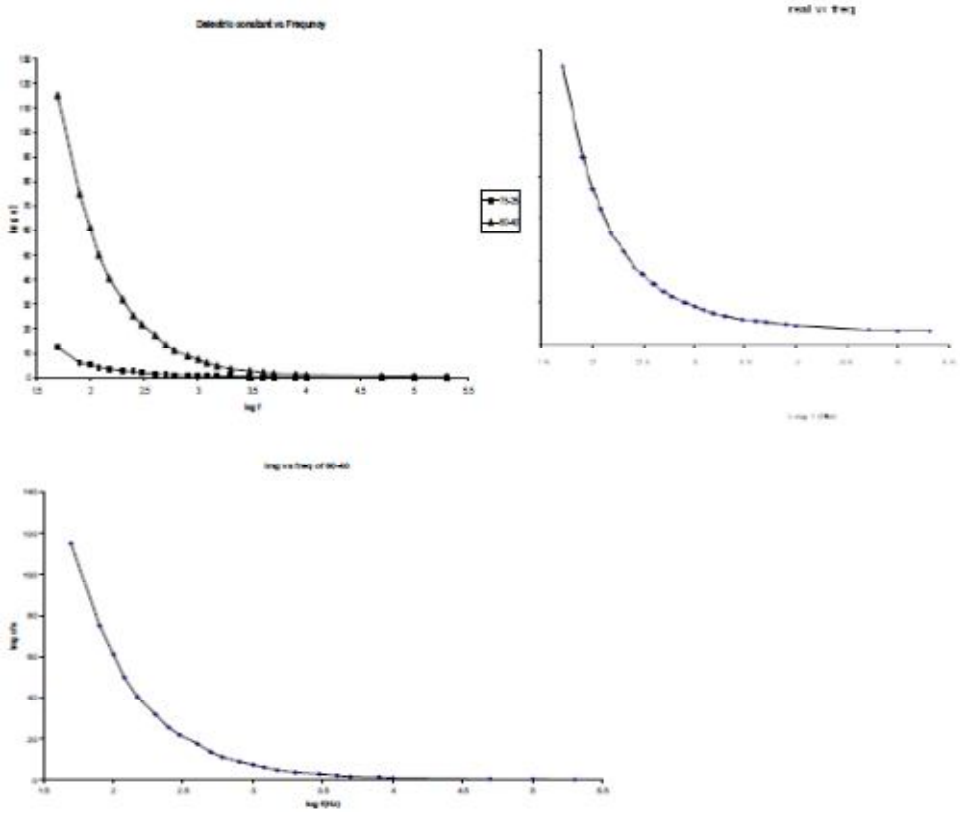
UV visible spectra of the casted films were taken using UV viible spectrometer (range 190nm-1100nm). From the UV visible spectra ,it is observed that the film samples are highly absorptive material.The transmission spectra showed that the (60:40)film have high transmission than (75:25)film.it is due to stronger bond formed in between chitosan &pcl polymers in the 60-40 film.





AC CONDUCTIVE MEASUREMENT:

frequency (f)	log f	capacitance ('C')	Dissipation factor (D)	real part(□')	imaginary part(□")
50	1.69897	23.6809	2.45512	5.129235948	12.59288976
80	1.90309	15.1123	1.84821	3.273294191	6.049735058
100	2	14.1632	1.76625	3.067721015	5.418362243
120	2.079181	15.5366	1.27502	3.36519673	4.290693134
150	2.176091	13.3156	1.24772	2.884132537	3.598589849
200	2.30103	12.4429	1.0794	2.695107449	2.90909898
250	2.39794	12.865	0.89316	2.786533471	2.488820235
300	2.477121	11.4306	0.80801	2.475845277	2.000507743
400	2.60206	10.7412	0.70105	2.326522605	1.631008673
500	2.69897	10.3468	0.5901	2.241096348	1.322470955
600	2.778151	9.974	0.5047	2.160348608	1.090327942
800	2.90309	9.5947	0.43377	2.07819298	0.901457769
1000	3	9.50875	0.37743	2.059576381	0.777345913
1200	3.079181	9.16657	0.34213	1.985460872	0.679285728
1500	3.176091	9.00928	0.28156	1.95139217	0.549433979
2000	3.30103	8.80345	0.2934	1.906809801	0.559457996
3000	3.477121	8.48556	0.19783	1.837955457	0.363602728
4000	3.60206	8.25796	0.16705	1.788657749	0.298795277
5000	3.69897	8.24618	0.1504	1.786106224	0.268630376
8000	3.90309	7.96128	0.13043	1.72439745	0.224913159
10000	4	7.82716	0.11797	1.695347324	0.200000124
50000	4.69897	7.24864	0.07523	1.57004104	0.118114187
100000	5	7.14013	0.06205	1.546537989	0.095962682
200000	5.30103	7.35185	0.06225	1.592396121	0.099126659



CONCLUSION

In the present studies ,the film samples were prepared successfully by blending chitosan/pcl in acedic acid solutions .the presence of chitosan in composite was proved by ftir results. it was clear that adding in to pcl there won't any change in crystal structure of pcl.the AC conductivity study shows that the samples has high conductivity at low temperature. The UV visible spectra showed that the chitosan /PCL films were highly absorptive material in nature.

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