An Executive Summary of the Final Report of Work Done on the Minor Research Project of Ms Nandini Shet entitled "Synthesis, Characterisation And Properties Of Polymer Blends Of Chitosan With Nylon 6,6 And Polyisobutylene" sactioned by UGC, vide Sanction Letter No. MRP(S)-0126/12-13/KAMA002/UGC-SWRO dated 23-09-2013.

Blending of polymers is one of the simplest techniques to produce new materials with improved properties to meet specific needs. The development of blends of synthetic and natural polymers provides a new direction to develop biodegradable polymers. In the present work, an attempt was made to prepare binary blends of Chitosan (a biodegradable polymer) with Nylon 6,6 and Polyisobutylene (PIB). Some of the mechanical and electrical properties of the blends prepared were studied.

Preparation of Blends:

The blends were prepared by solvent-casting method. 1% solutions of chitosan in formic acid and nylon 6,6 in formic acid were prepared and mixed in different proportions. The mixtures were stirred well to get homogeneous mixtures which were then poured into petri-dishes and the solvent was allowed to evaporate. On complete evaporation of the solvent, dry polymer-blend was left-behind on the petri-dish. Blends of chitosan and nylon 6,6 which contained different ratios by weight of the two components (from 1:9 to 9:1) were thus prepared.

Blends of chitosan and PIB were also prepared using similar procedure. However, here the solvent used for PIB was chlorobenzene.

Characterisation:

FTIR Spectroscopy:

The FTIR spectra of the blends prepared were recorded. The spectra were then compared with the FTIR spectra of the component polymers. It was observed that there were small shifts in the peak positions and intensity of absorption in the blend spectrum. Hence it was evident that there was some interaction between the two blended polymers. Most probably there would be some physical interaction between the polymers.

Differential Scanning Calorimetry (DSC):

Chitosan-Nylon 6,6 as well as Chitosan-PIB blends were subjected to DSC analysis. The variation in the melting point, glass transition temperature, decomposition temperature etc. with the blend composition was studied. In the chitosan-nylon 6,6 blends, the melting temperature of the blend has shown a gradual increase with the increase in the percentage of nylon-6,6 in the blend. In the chitosan-PIB blends, the melting temperature showed a decrease with an increase in the percentage of PIB.

Mechanical and Electrical Properties:

Young's Modulus:

Young's modulus for some of the blends were recorded by using Cantilever bending technique. The Young's modulus indicates the elasticity of the material. The Young's modulus of the blend increased with increase in nylon 6,6 content. Also, chitosan-PIB blend showed higher value for the Young's modulus than chitosan-nylon 6,6 blend.

Dielectric Constant:

Dielectric constants for some of the polymer blends were recorded by capacitance method. The increase in the chitosan content in the blend appeared to have increased the dielectric constant of the blend. Chitosan-PIB blend recorded much lower value of dielectric constant than chitosan-nylon 6,6 blend.

Conclusion:

Binary blends of chitosan-nylon 6,6 and chitosan-PIB containing different weight ratios of the components were prepared. The blends showed desired properties such as higher thermal stability and improved elastic strength when compared to pure chitosan.