

Influence of H- Bonding between the polymer chains on its physical properties

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Abstract: Some thermoplastics polymers like polyethylene, Nylon-6, Nylon-6,6, Nylon-6,10 and polyurea are taken to know the influence of H- b-Bonding between the polymer chains on its physical properties. It was found that more the H-Bonding between the polymer chains, their physical properties like tensile strength and crystallization melting temperature(T_M) will be more and more

Key Words: H-Bonding, tensile strength, Schweitzer's reagents, crystallization temperature, softening temperature ,commercial application.

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I. Introduction

The physical properties like tensile strength and crystalline melting point(T_M) are those types of physical properties which may be greatly influenced by H-Bonding between the polymer chains. These physical properties show high degree of agreement with the H-Bonding between the polymeric chains and their utility as a fibre is very much suitable.

II. Experimental

We have taken either of sodium hydroxide solution ,pyridine or Schweitzer's reagent¹(cupraammonium ions) as a solvent and dip the speciemen of polyethylene,nylon-6,nylon-6,6,nylon6,10, polyurea and cellulose polymers for 15-20 minutes.

After that the physical properties tensile strength and crystalline melting point² of our speceimen in two cases (i.e. one speciemen without soaking in solvents and other speciemen of each type after soaking in solvents) are measured.

III. Results and Discussion

(i) It as found that those speciemens soaked in the solvents have low value of tensile strengths and crystalline melting point than the corresponding unsoaked speciemens of polymers (ii) The deteriorating tensile strength and crystalline nelting point are due to broken of some H-Bonds beteen the polymer chains.

IV. Conclusion

A hydrogen bonds thus act as cross-links³ bewteen polymer chains. The structures of the polymers are sufficiently regular to enable numerous H-Bonds to be formed ,their combined effects may have the profound influence on the physical properties tensile strength and crystalline melting point.

In nylon class of polymers, amide group present in regular succession⁴ along each chain and and numerous H-Bonds found.

In class of polyesters have the charecteristics repeating units: NH-(CO)-NH- and this provides increased opportunities for H-Bonding.

Therefore ,the softening temperature⁵ of nylon class and polyurea are high. In class of nylons polymers, the less frequently the amide groups are spaced along the chain, the lower the softening point, tensile strength of polymers and thus the more flexible the polymers.

Those polymers having more chain flexibility have lower value of crystalline melting point (T_M) than less chain flexible polymers .The crystalline melting point also decreases on cross – linking oof polymers. The fact in ease of chain flexibility of polymers are ease of rotation and in case of the cross linking , it affects the velocity of crystal nucleation.

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