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Molecular interactions of poly (methyl methacrylate), poly (vinyl alcohol), poly (ethylene glycol), chitosan, cellulose and starch polymers with iodine

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The interactions between poly (methyl methacrylate) (PMMA), poly(vinyl alcohol) (PVA) poly(ethylene glycol) (PEG) as industrial biopolymers and chitosan, cellulose and starch as natural biopolymers with iodine mixed by diethyl ether for homogenous solid mixture show a clear depression in the glass transition temperature (Tg) for all polymers as well as new colors appear except cellulose unaffected. It appears that cellulose molecules coated with a film prevent iodine to diffuse through the net work structure of cellulose thus no effected its color or its Tg which indicates that molecular structure of cellulose quite different from that of starch and for this fact cellulose is not soluble by a solvent and undigested in the human body. The depression in the Tg values of polymers indicates that iodine ruptures the engineering bonds of the polymers. The most effected Tg is of chitosan (lowered by 40.23˚C), this mean that iodine ruptures both hydrogen bonding through nitrogen and oxygen atoms in chitosan molecule. From Tg values it seems that iodine can acts as moderate plasticizer, by diffusing through the net of biopolymers and natural biopolymers ruptures their secondary bonds result in depression of their Tg except in case of cellulose. The order of Tg depression chitosan>PMMA=starch>PVA>PEG>cellulose. From Tg values calculation of the energy given by the addition of iodine to the polymers was done. These energies are a function of iodine cause a depression in the original Tg of pure biopolymers 27.394>18.442=18.414>9.316>4.315>0 (kJ mol-1).