STUDY OF PLASTICIZED POLY (VINYL CHLORIDE) USING BIOBASED PLASTICIZERS MIXTURES

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Abstract : Poly (vinyl chloride) (PVC) is very present in daily living applications due to its diverse properties and low cost. Its properties depend on the amount of different kinds of additives such as plasticizers. The plasticizer is a very important additive of PVC; it can improve the flexibility of PVC without changing the chemical properties of the PVC. Phthalates are the most commonly used plasticizers in PVC with applications in food packaging, medical devices, children's toys, building materials, and other common products. Unfortunately, phthalates contaminate indoor environments, human food and are environmental contaminants. Several phthalates are suspected of having toxic effects.Biobased blends present potential use as nontoxic, sustainable plasticizers and as replacement of commonly used phthalate plasticizers. Epoxidised sunflower oil (ESO) and epoxidized sunflower oil methyl ester (ESOME) were prepared respectively by epoxidation and esterification reactions of sunflower oil (SO). Samples prepared by different combinations of ESO, ESOME, isosorbide (ISB) and acetyl tributyl citrate (ATBC) were blended with poly(vinyl chloride) (PVC) using two roll mills at 160°C. Discoloration sheets, mechanical properties, thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC) were used to characterize the plasticized PVC.Discoloration change as well as thermal degradation decreases when increasing the amount of ESO or ESOME in plasticized systems. The effect of the four plasticizers systems on the glass transition temperature of PVC is similar; all samples exhibited both single Tg by DSC, which is in agreement with good miscibility of our formulations. Thus, combination of ESO, ESOME, ISB and ATBC performs a dual role in the stabilization and plasticization of PVC. Tensile strength at break of PVC formulations with different plasticizers mixtures reduces by decreasing the ESO or ESOME level, the elongation at break increases in the case of ISB with ESO or ESOME. The same with ATBC increases when rising ESO or ESOME.ATBC, ISB with 10 to 20 phr of ESO or ESOME are good candidates to substitute phthalates such as DEHP in flexible PVC formulations.

Keywords : PVC, Epoxidation, Biobased Plasticizers, Environment.