PREPARATION AND PROPERTIES OF PLASTICIZED POLY (VINYL CHLORIDE)/ORGANICALLY MODIFIED MONTMORILLONITE NANOCOMPOSITES

Onsy. I. H. Dimitry[a] , Azima. L. G. Saad[b]
[a]*Petrochemicals Dept., Egyptian Petroleum Research Institute ,Nasr City, Cairo,11727, Egypt*
[b]*Microwave Physics Dept.,National Res.Centre,Cairo,12311, Egypt*
(e-mail: onsy_dimitry@hotmail.com)

Nanostructured polymers have attracted much attention in material science because of their unique properties and their applications in nanomaterials and nanodevices. In this study; an organophilic montmorillonite (OMMT), Cloisite 6A, was used as nanoclay. Plasticized poly(vinyl chloride) (PVC)/OMMT nanocomposites containing 1,3,5,7, and 10 wt% of Cloisite 6A were prepared via melt compounding using a twin screw extruder.

Compared to neat PVC the nanocomposite containing 5 wt% organoclay shows, from TGA, the greatest enhancement of decomposition temperature[1]. The interaction between PVC and silicate layer was studied by FTIR spectroscopy which confirms strong interactions between the nanometric silicate layers and PVC segments. Electrical conductivity σ measurements show that σ of nanocomposites increases with increasing temperature from 30 to 100°C, and show a considerable increase in the σ of plasticized PVC with increasing filler content up to 5 wt%, especially at higher temperatures (Table 1). The obtained values are situated between the two extremes of those of semiconductors (10^{-10} - 10^{+2} Ω^{-1} cm^{-1}).The activation energy E_σ was found to be lowest for the composite containing 5 wt% organoclay.The nanoscaled dispersion of silicate layers and strong interfacial interactions between silicate layers and PVC chains effectively enhance the tensile properties of plasticized PVC nanocomposites upon using 5 wt% organoclay.The dispersed behavior of organoclay in PVC matrix was identified by using XRD, TEM, and SEM analyses[2] which reveal the exfoliated structures in these nanocomposites when 5 wt% of Cloisite 6A was used (Figure 1).

1. T. Peprnicek *et al*, Polym. Degrad. Stab. 91,1855 ,2006.
2. B. Lepoittevin *et al* ,Polymer 44,2033 ,2003.

Table 1. Electrical conductivity (σ) of plasticized PVC mixed with various proportions of Cloisite 6A

Samples*	σ x10^9 (Ω^{-1} cm^{-1}) at various temperatures (^{o}C)							
	30	**40**	**50**	**60**	**70**	**80**	**90**	**100**
PVC-DOP-0	**--**	**--**	**0.01**	**0.02**	**0.04**	**0.06**	**0.09**	**0.12**
PVC-DOP-1	**0.02**	**0.04**	**0.14**	**0.31**	**0.74**	**2.12**	**4.79**	**9.80**
PVC-DOP-3	**0.05**	**0.15**	**0.51**	**1.12**	**2.63**	**7.51**	**16.98**	**34.60**
PVC-DOP-5	**0.07**	**0.20**	**0.69**	**1.52**	**3.59**	**10.37**	**23.66**	**48.50**
PVC-DOP-7	**0.06**	**0.18**	**0.61**	**1.35**	**3.18**	**9.14**	**20.73**	**42.30**
PVC-DOP-10	**0.04**	**0.13**	**0.46**	**1.01**	**2.37**	**6.81**	**15.40**	**31.53**

* The numbers in the names of the samples indicate the content of Cloisite 6A; for example, PVC-DOP-5 means a sample with 5 wt% of Cloisite 6A

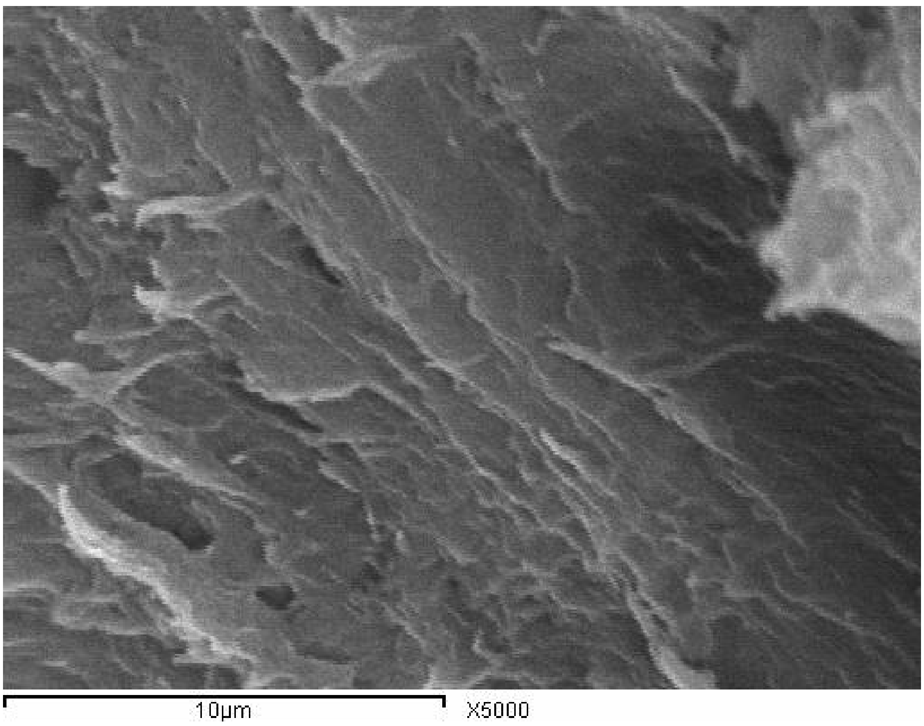

Figure 1: SEM micrograph of plasticized PVC/5 wt% Cloisite 6A nanocomposite