

# Effect of Migration of Layered Nanoparticles during Melt Blending on Phase Morphology of Poly (ethylene terephthalate)/Polyamide 6/Montmorillonite Ternary Nanocomposites

Guomin Xu<sup>a,b</sup>, Shuhao Qin<sup>b</sup>, Jie Yu<sup>b</sup>, Yifu Huang<sup>a</sup>, Mingqiu Zhang<sup>a</sup>, Wenhong Ruan<sup>a\*</sup>

\*Corresponding authors: cesrwh@mail.sysu.edu.cn

## 1. Calculation of surface tension ( $\gamma_{\text{OMMT-PA6}}$ , $\gamma_{\text{OMMT-PET}}$ and $\gamma_{\text{PA6-PET}}$ )

Based on Young's equation, different approaches were developed to determine the interfacial tension between pair components of  $\gamma_{\text{OMMT-PA6}}$ ,  $\gamma_{\text{OMMT-PET}}$  and  $\gamma_{\text{PA6-PET}}$ . For polar systems, two forms of equations are more common. The first is geometric mean equation:

$$\gamma_{12} = \gamma_1 + \gamma_2 - 2[(\gamma_1^d \gamma_2^d)^{0.5} + (\gamma_1^p \gamma_2^p)^{0.5}] \quad (1)$$

and the second is Wu's harmonic mean equation:

$$\gamma_{12} = \gamma_1 + \gamma_2 - 4[\frac{\gamma_1^d \gamma_2^d}{\gamma_1^d + \gamma_2^d} + \frac{\gamma_1^p \gamma_2^p}{\gamma_1^p + \gamma_2^p}] \quad (2)$$

Where  $\gamma_1$  and  $\gamma_2$  are the surface tensions of components 1 and 2,  $\gamma_1^d$  and  $\gamma_2^d$  are the dispersive parts, and  $\gamma_1^p$  and  $\gamma_2^p$  are the polar parts of the surface tension of components 1 and 2.

In this work, the surface tensions of two polymers had been studied by contact angle measurement at room temperature and the surface tension of OMMT was obtained from related reference [1]. Then these values were extrapolated to the processing temperature of 255°C, using temperature coefficients ( $-\text{d}\gamma/\text{d}T$ ) extracted from references [2,3] (see Table.1S).

Table 1S Surface tensions of Polymers and OMMT

Material	Surface tension at 23.5 °C (mN/m)			Temperature coefficient $dy/dT$ (mN/m°C)	Surface tension at 255 °C (mN/m)		
	Total	Dispersive part	Polar part		Total	Dispersive part	Polar part
PA6	51.4	42.07	9.33	0.065 <sup>a</sup>	36.35	29.75	6.60
PET	48.23	44.54	3.69	0.065 <sup>b</sup>	33.18	30.64	2.54
OMMT	48.35 <sup>c</sup>	34.6c	14.75 <sup>c</sup>	0.1 <sup>c</sup>	25.20	18.03	7.69

<sup>a</sup> Value for PA6 reported in Ref.[2]

<sup>b</sup> Value for PET reported in Ref.[3]

<sup>c</sup> Value for OMMT(DK2) assumed to be the same as that for Cloisite 30B reported in Ref.[4]

## References

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