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Abstract
This study contains three sections. The first section is study of rigid poly (vinyl chloride) compounds blending with clay. The second section is study of rigid poly (vinyl chloride) compounds blending with micro/nano-CaCO3. The third section is study of high density polyethylene blending with micro/nano-CaCO3.

In the first section, PVC/clay nanocomposites were successfully prepared by a Haake torque rheomix and examined by XRD and TEM. The fusion properties showed that the fusion time and the fusion temperature were increased, but the fusion torque was decreased, with the content of organic clay was increased. The opposite effect was occurred when the untreated clay was used. From the thermal results, the glass transition temperature of nanocomposite was increased and the thermal stability was decreased. From the mechanical property analyses, it showed that the clay improved the yield strength and elongation of two kinds of PVC/clay nanocomposites. The Young's modulus of PVC/untreated-clay nanocomposite was increased. On the other hand, the organic clay had the opposite effects due to the organic chemical between the silicate layers and resulted in the Young's modulus decreasing.

In the second section, the fusion properties showed that the loading torque, the loading temperature, and the fusion torque were decreased with the content of calcium carbonate was increased. But the fusion time and fusion percolation threshold were increased with the content of calcium carbonate was increased. The effect of the nano-CaCO3 was more significant than that of the micro-CaCO3. From the thermal properties, Tg and thermal stability of PVC/CaCO3 nanocomposites were increased with the content of nano-CaCO3. The 10phr nano-CaCO3 had the best result. On the other hand, the micro-CaCO3 caused the opposite results. The SEM morphology results showed that CaCO3 were dispersed in the composite and resulted in voids. The PVC/nano-CaCO3 nanocomposites exhibited lightweight and good properties.

In the third section, the variation is different kind of CaCO3, the content of CaCO3, and powder or pellet type HDPE. The fusion properties showed that the lower loading torque and the higher fusion time resulting from the HDPE powder. The HDPE/nano-CaCO3 nanocomposites displayed the higher loading torque and the shorter fusion time than those of the HDPE/micro-CaCO3 composites. From the TGA results, it showed the thermal stability of HDPE/nano- or micro- CaCO3 composites were improved, especially for the nano-CaCO3. From the DSC non-isothermal

crystallization analysis, the crystallization temperature of HDPE was increased with the content of $CaCO_3$ was increased. It implied the crystallization rate of HDPE was increased. The crystallinity of HDPE was decreased with the content of $CaCO_3$ was increased. The melting point of HDPE was decreased due to its crystallinity was decreased.
Advisory Committee Cheng-Ho Chen - advisor

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