

Study on the optimization of the screw segment composition of the nano-clay reinforced elastomer composite by twin screw extruder

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Generally, it is known well that a mechanical property and the gas barrier characteristic will improve by adding the clay of the nano-particle level in small quantities to polymer. And when compounding the nano-clay and polymer, twin screw extruder is often used. But, when the nano-clay is compound to elastomer, composites become high temperature by shear stress. Therefore, because segment composition uses low shear stress type, it is difficult to improve dispersibility only by optimizing operation conditions. On the other hand, there is the report to be able to improve the dispersion of the nano-clay by using supercritical carbon dioxide. And in order to use supercritical carbon dioxide, we have to make the zone which maintains carbon dioxide at a supercritical state within the twin screw extruder. There is a seal ring segment as an element used in order to make zone. And polymer is dammed up near the seal ring portion, and high pressure occurs by the filled polymer. As a result, a supercritical state is maintainable. However, in arrangement of the seal ring used in a supercritical process, elastomer will cause thermal degradation by high shear stress near the seal ring portion. As a result, even if the dispersibility of nano-clay improves according to a supercritical process, the mechanical properties of compound decrease. The purpose of this study is the optimization of seal ring segment composition when the nano-clay compounds to elastomer by using twin screw extruder. Therefore, the pressure state was analyzed with different seal ring segment composition. From the analysis result, the optimal segment composition was decided. And pressure measurement was performed in the experiment by using ZSK-18 which has arranged the same segment composition as an analysis result. As a result, the pressure of an analysis result and an experimental one indicated the same tendency.