



STUDY ON POLYMER/CLAY NANO COMPOSITE COMPOUNDING PROCESS UNDER HIGH SHEAR STRESS AND PRESSURE CONDITIONS.

Yasuyoshi Nakayasu, Tomoyuki Ootoshi, Tatsuya Tanaka, Yutaka Imaida,

Engineering department, Doshisha University

In recent years, polymer nano composite that uniformly disperses the filler of the nano scale in polymer is getting much attention. The clay that is an inorganic stratified compound of the nano scale is chiefly used for the filler of the nano composite. The nano composite is formed when the layer of clay exfoliates and distributes in polymer. It usually needs to disperse into solvents each layer before compounding by twin screw extruder. And in twin screw extruder, it is necessary to volatilize a lot of solvents. As a result, it becomes difficult to obtain the good properties when clay and polymer are compounded by twin screw extruder. Therefore, a new processing technology must be developed that manufactures the nano composite without the solvent. It is made to imagine that a high shear stress and pressure conditions are required.

From the above reason, the purpose of this research clarify that what kinds of high shear stress and pressure conditions can be made the clay exfoliate. Because of it, we focus on the injection mechanism of the injection molding machine for the nano composite manufacturing device. High shear force is added to the sample by pushing the sample out to nozzle of a small flow channel diameter, and making the nano composite is tried. Polypropylene and Polyamide6 are used for polymer for the experiment sample, and the Organo-bentonite (organically modified clay) is used for filler. The experiment that dispersed the clay was done by using the nozzle of flow channel diameter $\Phi 1.0$. We used XRD measurement, the tensile test, and the TEM observation to examine the decentralization of the clay layers of the experiment sample. It has been understood that the layer of the clay does the exfoliation dispersion from the TEM observation in the sample of PA6.