Synthesis of Inorganic Network Structure in Polypropylene Nanocomposite Prepared by ImpregnationMethod

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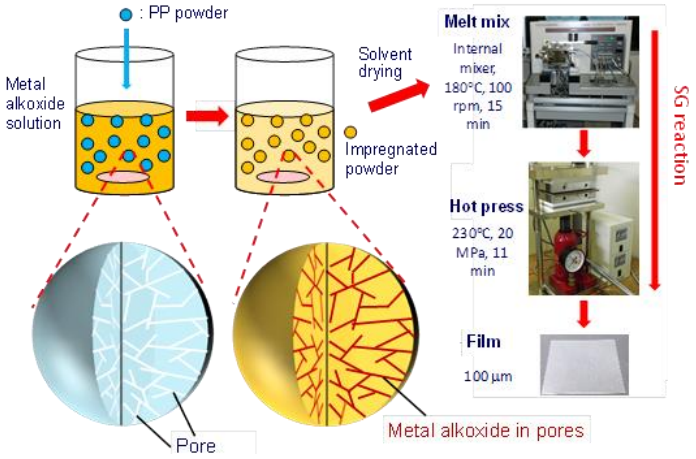
Polypropylene (PP) is one of the most widely used polyolefin due to good mechanical properties, high processability, low environmental load and high chemical resistance. PP-based nanocomposites have attracted particularly large expectation owing to its high demand in the market. However, it is difficult to achieve good dispersion of polar fillers in the nonpolar PP matrix. Method for overcoming this problem is addition of compatibilizer such as maleic anhydride grafted PP, organic modification filler surface, and using in-situ sol gel method.



In this research is to develop a more versatile strategy for the large-scale fabrication of nanosized metal oxide networks in the PP matrix. We use impregnation method for the pretreatment. It considered that precursor dissolved in a solvent impregnate for polymer and can prepare PP/common ceramics nanocomposites.

In this study, PP/metal oxide nanocomposites were prepared through the impregnation of PP amorphous part with metal alkoxide and subsequent sol-gel reaction. A new approach for preparing better PP nanocomposites is to apply the sol-gel technique. We tried to impregnation and sol-gel reaction of metal alkoxide in porosity of PP reactor powder, which have a large number of pores derived by the structure of the catalyst. It leads to the formation of an inorganic network throughout the polymer matrix. It was attempted to develop more versatile strategy for the large-scale fabrication of nanosized metal oxide network in the PP matrix. In chapter2, the metal oxide particle was prepared with the impregnation time of 9 h makes homogenously dispersed and formed small aggregates in the matrix. It was suggested that long time of impregnation method impregnate the precursor into pores of PP powder surface. It considered that long period of time reach the impregnation equilibrium.

In chapter 3, PP/Al_2O_3 nanocomposites was prepared using impregnation method, where a precursor dissolved in solvent was impregnated into pores of PP reactor powder prior to sol-gel reaction. Thermal conductivity may be achieved by introducing a network structure of Al_2O_3 within polymer matrix. The thermal conductivity was improved by the method, owing to the formation of Al_2O_3 filler network. Further, combination of impregnation and sol-gel methods with nanoparticle was found to be quite effective for achieving the high thermal conductivity of PP nanocomposites.

Novel design of metal oxide network in polypropylene using sol-gel method using impregnation method achieved and the development is expected to expand both academic and industrial area.

Key Words: Polypropylene, Nanocomposite, Sol-gel method, Impregnation, Network structure