Highly thermal conductive polypropylene nanocomposites having Al2O3 network formed by the combination of impregnation and sol-gel methods.

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Polymer nanocomposites have been attracted great interests because their properties such as gas permeability, transparency and mechanical properties are dramatically improved even at a low filler loading [1,2]. The most important parameters to control the properties of the composites are related to the dispersion and the structure of inorganic filler. Nano-level dispersion of inorganic filler is essential to achieve improvements.

Polypropylene (PP) is one of the most widely used plastics due to good mechanical properties, high processability, low environmental load, high chemical resistance, and so on. PP-based nanocomposites have been attracted particularly large expectation owing to its high demand in the market. However, it is difficult to achieve good filler dispersion in PP due to their poor compatibility. The most frequently employed method for overcoming this problem are the addition of a compatibilizer such as maleic anhydride grafted PP [3] and the organic modification of filler surface [4]. A new promising approach for preparing better PP nanocomposites is to apply the sol-gel technique [5]. We tried to proceed hydrolysis and condensation reactions of metal alkoxide in a polymer matrix. It leads to the formation of an inorganic network dispersed 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.
Al_2O_3 has been regarded having high thermal conductivity.

In this paper, 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. The thermal conductivity was improved by the method, owing to the formation of Al_2O_3 filler network (Figure 1).

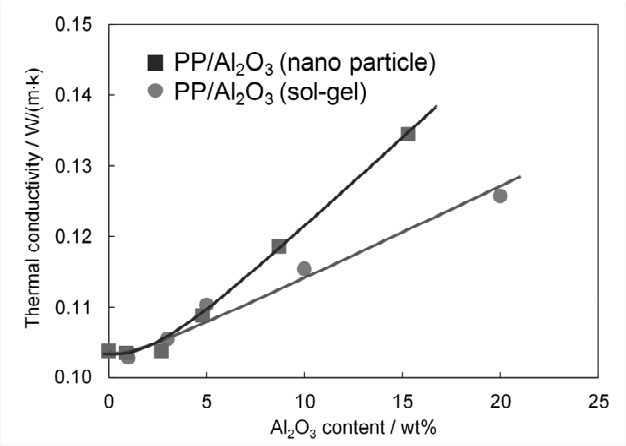

Figure 1. Thermal conductivity of PP/Al_2O_3

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