



INFLUENCE OF THE DEGREE OF EXFOLIATION ON THE THERMAL CONDUCTIVITY OF POLYPROPYLENE NANOCOMPOSITES

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The major requisites for the calculation and configuration of heating and cooling procedures in polymer processing are accurate and reliable physical models as well as material data, which characterize the real process conditions. One of these material parameters is the heat conductivity. It is well known, that mineral fillers are influencing the heat conductivity significantly by means of an increase with increasing filler content. This causes major changes in the heating and cooling behavior, apparent for example in shorter heating and cooling cycles regarding injection molding. When it comes to layered silicates, the heat conductivity is not only depending on the filling degree but also massively on the degree of exfoliation. Aim of this study was the determination of the influence of exfoliated silicate layers on the heat conductivity of polypropylene compounds. Especially the correlation of heat conductivity increase with the degree of exfoliation is examined and compared to common mineral fillers like talcum and calcium carbonate. Thereby, the heat conductivity as a function of temperature is measured using a transient method with a plane heat source according to ISO 22007-2/2008 (hot disk). To determine the degree of exfoliation, the processed samples were also investigated using x-ray diffraction and tensile tests. The results show clearly that not only the filler content but also the size and number of the main particles massively influence the heat conductivity. With respect to this, the smaller the particles and the more particles are in the matrix the more is the increase of heat conductivity. Thereby, compared to common fillers, the heat conductivity increase is considerable higher with exfoliated layered silicates and directly depending on the degree of exfoliation.