Study of Structure and Molecular Mobility of Thermoplastic Starch-Based Nanocomposites Using NMR

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Abstract. The influence of montmorillonite (MMT) content on the structure and molecular mobility of thermoplastic starch-based nanocomposites with glycerol as a plasticizer was studied using nuclear magnetic resonance (NMR) spectroscopy. The increase in the width of signals in ^{1}H NMR spectra for samples with increasing MMT content and the broadening of signals from ^{13}C nuclei in CH and CH_2 in glycerol molecules in the ^{13}C NMR spectra indicate that glycerol and water molecules are intercalated in MMT particles. This results in a decrease of both water and glycerol mobility as well as the mobility of starch chains in bulk sample. On the other hand, intensities of broad signals in ^{1}H BL NMR spectra successively decrease with the increase of MMT content as a result of the intercalation of a small number of starch chains in MMT interlayer space resulting in their higher mobility compared to bulk sample.