ABSTRACT

Modern trends in material science define the need for the preparation and optimization of new materials with particular properties and characteristics. The aim is to create materials with innovative applications and uses in new fields of technology and everyday life. Such materials are also the *nanocomposite* materials which combine desirable properties from the area of polymers and organic nanoparticles and are the subject of this particular postgraduate work.

The specimens that were examined had a polydimethylsiloxane (PDMS) matrix. This specific polymer existed at two different molecular weights; the first, named PDMS 400, had a Mr = 5700, and a polymerization degree dp = 75, the second, with the PDMS 50 had Mr = 2970 and dp = 38. The fillers on which the PDMS was adsorbed were of three types: colloidal graphite and two kinds of carbon nanotubes, named CNT681 and CNT730, which differed only in their manufacturing process. CNT 681 was prepared by CVD through propane-butane pyrolysis, while CNT 730 was propylene pyrolysis. All specimens were prepared in the laboratory "Kremniypolimer", Zaporozhye of Ukraine, by Dr. Yulia Bolbukh. The differential scanning calorimetry method was used to obtain the results, which depicted the thermal properties and changes in basic calorimetry sizes (such as crystallization and glass transition temperature), depending on the type of specimen we placed for measurement.

The results were presented in combined diagrams showing the different heating-cooling cycles for the different types of specimens. Their differences are shown in-situ. On the other hand, comparative diagrams of basic values, such as the *degree of crystallinity*, the *mobile and rigid amorphous fraction* (percentage) of the mobile and rigid part of the amorphous polymer, the change in *heat capacity*, as well as the *crystallization and glass transition temperatures* are presented as a function of the polymer content.

The main conclusion assumed in this study is the effect of carbon nanotubes on the degree of crystallinity and in general on the crystallization of polymer chains for both different molecular weights of PDMS. *Nanotubes act as crystallization cores, compared to colloidal graphite which does not exhibit such behavior*, and this is something that requires further scientific exploration and study.