INTERNATIONAL RESEARCH AND PRACTICE CONFERENCE "NANOTECHNOLOGY AND NANOMATERIALS"

The NANO-2023 Conference is dedicated
to the brave men and women serving in the Armed Forces
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The NANO-2023 Conference was organized by the Institute of Physics of NAS of Ukraine with the participation of the University of Tartu (Estonia), the Lviv Polytechnic National University, University of Turin (Italy) and Pierre and Marie Curie University – Paris 6 (France).

NANO-2023 was the 11th conference in the series of NANO-conferences initiated by the Institute of Physics of NAS of Ukraine in 2012 in the framework of FP7 Nanotwining project. From year to year, they attract more attention and participants. In 2012, the first meeting was held in the format of International Summer School for young scientists «Nanotechnology: from fundamental research to innovations». The 2013 and 2014 conferences were organized in conjunction with the International Summer Schools for young scientists under the same title. In 2013, this event was attended by more than 300 scientists, in 2014-2017, 450 scientists took part and in 2018 it gathered above 650 participants. In 2021 conference was attended by more than 700 scientists from Ukraine, Poland, Italy, Estonia, France, Austria, Germany, Greece, Turkey, USA, Romania, Moldova, Czech Republic, Taiwan, Lithuania, Egypt, Iran, India, Algeria, Indonesia and other countries. In 2021 and 2022 the Organizer Committee has received more than 500 application forms from about 25 countries of the world each years.

The NANO-2023 conference brought together leading scientists and young researchers from many countries of the world. This year its topics were as follows: Nanobiotechnology for health-care; Nanochemistry and biotechnology; Nanocomposites and nanomaterials; Nanoobjects microscopy; Nanooptics and photonics; Nanoplasmonics and surface enhanced spectroscopy; Nanoscale physics; Nanostructured surfaces; Physico-chemical nanomaterials science.

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Chemical plasticization of polymers without side groups

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We investigated the features of chemical plasticization of amorphous polymers for decreasing the polarity of the macromolecules, the replacement of the lateral polar groups on less polar and non polar or rigid fragments of the macromolecule chains to the flexible ones. For heterochained polymers whose chains contain no side groups, one of the methods of chemical plasticization is the reduction of the polarity of the macromolecule units. For polyoxides and polyiminates, replacement in polar groups on non-polar, for example, polyethylene oxide groups -O- with a dipole moment of 0.45 D, and in the polyvinylimine of the group -NH- - with a dipole moment of 0.4 D for the nonpolar group -CH_2-, leads to the loss of the polarity of the polymer and the dipole-dipole interaction, which is typical for polymethylene.

When replacing polar groups in the polyethylene oxide and polyimine with correspondingly certain values of the dipole moment (μ) to the nonpolar methylene group, the forces of intermolecular adhesion (E_{cog}), are weakened, the segments become more flexible and movable (decreases T_c), and the polymer is less elastic (G_a - decreases). For selected polar polymers, Tc polyethylene oxide and polyimine do not correlate with the values of their dipole moments. Tc of polyethylene oxide is lower than that of polyimine, and its link is more polar than the link of polyimide. The reason for higher compared to polyethylene oxide Tc, polyethylenimine has the higher value of internal rotational energy ($U_{во}$) around the -NH bond compared to the bond -O-. This corresponds to the phenomenon of plasticization. Agrees with the conclusion and an increase in the Van der Waals volume ($V_{вв}$) - the space taking the monomeric link, which can not penetrate other links with energy that corresponds to normal temperatures.

The chemical plasticization of simple polyeters by increasing the number in the chain of a macromolecule of non-polar -CH_2- groups occurs effectively with a small size of the methylene fragment, when the polymer has a strong dipole-dipole interaction and these additional non-polar groups significantly weakens this interaction. With the increase in the size of the methylene fragment, when the distance between the polar groups becomes large and the dipole-dipole interaction of the macromolecules weakens, the addition of new non-polar groups does not significantly change intermolecular interaction, since it mainly determines the weak forces of Van der Waals.