Topological structure and self-diffusion in linear flexible polymers

© **Tatiana P. Kulagina**, **Grigory E. Karnauksh**,*[+] **Varvara A. Varakina**,
Lev P. Smirnov, and **Anastasiya N. Kuzina**
Institute of Problems of Chemical Physics RAS. Prospect Semenova,1. Chernogolovka, 142432.
Moscow region. Russia. Phone: +7 (496) 522- 18-79. E-mail: tan@icp.ac.ru
_____
*Supervising author; [+]Corresponding author

Keywords: *nuclear magnetic resonance, linear flexible polymers, free induction decay, physical network of entanglement, stimulated echo, self-diffusion.*

Abstract

In this work the theory of free induction decay in linear flexible polymers with various average lengths of polymeric chain in a wide temperature range is developed. It is shown that with the growth of mean molecular weight of cross-site chains M_w topological structure of linear polymers changes, and at $M_w > 10^5$ the physical network of entanglements is formed. The correlation function of molecular motion is obtained which is applied for calculating the diffusion attenuation of spin echo.

The general approach to calculation of diffusion attenuation spin echo signals and its application to determination of self-diffusion coefficient in linear polymers with different topological structure is offered. It allowed to explain the observed experimentally anomalous diffusion.