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COULD THE LASER LIGHT SCATTERING METHODS ELUCIDATE THE PROBLEM OF MOLECULAR INTERACTIONS?

Ar putea metodele de difuzie a luminii laser să elucideze problema interacţiunilor moleculare?

To fulfill their specific role, the macromolecules called polymers interact with each other or with solvents predominantly through hydrogen bonds, electrostatic interactions or charge transfer interactions. Based on the specific secondary interactions, most polymers are able to form macromolecular complexes or improve their miscibility, precisely due to the large number of interactions established at intramolecular or intermolecular level, although from an energetic point of view they are known to be inferior to chemical bonds.

Unlike other physical methods that directly highlight the presence of the molecular interactions, and through which they can even be quantified energetically, the light scattering methods can provide indirect proof of the presence of the interactions in a multicomponent system. Laser light scattering involves recording under various scattering angles of the intensity of the light coming from a laser source that has crossed a usually homogeneous medium such as a polymer solution.

After the transformation of the light signals into electrical signals by the detector photodiodes, the use of the Zimm theory of laser light scattering, and the processing of the experimental data through various calculation formalisms (Zimm, Debye, Berry), some quantities characteristic to the macromolecules in solution can be determined: weight average molecular weight M_w, root-mean-square radius of gyration R_g, hydrodynamic radius R_h and second virial coefficient A_2. Any variation in the values of these parameters of the polymers present in a multicomponent system, compared to the values of single polymers, is a sign of the presence of interactions in that system.