The development of information systems used in applications for mass forced to search for new materials that can meet the ever increasing requirements. Interesting family of polymers for the telecommunications applications are photosensitive polymers. These polymers can create various kinds of the organic diffraction gratings, optical vortices, and may be a photosensitive medium to the orientation of the liquid crystals (LC) under the polarized light irradiation. As promising materials for applications as a layer for orienting liquid crystals (LC) are believed to photochromic polymers, which are characterized by readily modify and adapt their properties to the optical process, high thermal and chemical stability and the possibility of forming thin layers on a variety of substrates. So far, the orientation of the LC based mainly on the use of mechanical method involving induction of orientation of the polymer layer by "rubbing". Although this method is easy and cheap, it is the process of rubbing it comes to microinjuries active layer of polymer, which are disadvantageous in the process of orientation of the LC. Therefore we are looking for alternative methods of LC orientation. One of them is to use a photosensitive layer ordering polymers containing in their structure of azobenzene derivatives. The proposed project is connected with the synthesis of a new photochromic materials containing azobenzene derivatives and investigation of the selected physicochemical properties, including properties induced by the polarized light. The object of the research will be polyimides and their precursors poliamidokwasy with covalently bounded derivatives of azobenzene. The research under this project are connected with synthesis of a low molecular weight compounds, i.e. azo-dyes being derivatives of the azobenzene and modified dianhydrides, which will be used for the synthesis of a new polyimides and poly(amic acid)s with covalently attached chromophores. Azopolymers have very limited solubility, which adversely affect the ability of their potential application. The proposed solutions associated with the modification of the structure of macromolecules, namely the introduction of appropriate functional groups; synthesis of co-polyimdies and poly(amic acid)s, should significantly improve the solubility of polymers in common organic solvents. The second group of polymers intended for investigation in this project are supramolecular assembles where the azo-dye is connected to the polyimide matrix by the hydrogen bonding. We proposed use the calculating method to investigation the glass transition temperatures of the supramolecular assembles and compared with dates evaluated by the experimental method (DSC). The possibility of calculation to estimate the value of T_g brings many advantages. First of all, this method would provide the ability to determine the T_g of the system before receiving it, knowing only the content and the glass transition temperature of the components of the assemble. This would enable a quick exclusion for further investigation, polymers having too low T_g. Secondly, it would be possible to estimate the content of the azo-dye in the assemble to obtain a polymer having a specific, predetermined value of T_g. The possibility of using theoretical methods to determine the T_g of the supramolecular assembles has not been reported in the literature, so far.

The resulting compounds will undergo a comprehensive examination of selected physicochemical properties. The polymers with the desired properties will be examined the photoinduced optical anisotropy by studying the photoinduced birefringence. Polymers exhibiting high and stable value of the photoinduced birefringence, will be examined for application as a layer of aligning of the liquid crystals.

The results should allow to formulate some general relationship between the chemical structure of the material, the molecular weight and physic-chemical properties, enabling modeling of the chemical structure of the polymer leading to obtaining a material with properties appropriate to the optical process. The results can be both cognitive which extends the general knowledge of the photochromic polymers and the application, which allows to obtain new materials for potential use in optoelectronics and photonics, and in particular a layer for aligning of the liquid crystals.