The kinetics of the E-Z-E isomerisation and liquid-crystalline properties of selected azobenzene derivatives investigated by the prism of the ester group inversion.

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Streszczenie

Two new groups of azobenzene ester derivatives were synthesised: alkyl 4-[4-(nonyloxy)phenyl]diazenyl]benzoates and 4-[4-(nonyloxy)phenyl]diazenyl]phenyl alkanoates. All 35 presented homologues are mesogenic. Moreover, some of the above-mentioned compounds exhibit rich liquid-crystalline polymorphism likewise tetramorphism. During this investigation by the use of polarising optical microscopy, differential scanning calorimetry and X-Ray studies, six types of mesophases were detected: nematic, smectics (A, C, I, F) and G. Furthermore, due to the presence of the photosensitive azo moiety, the E-Z isomerisation reaction is possible. This process, which is initiated by the UV irradiation, causes significant changes in the UV-Vis absorption spectra of investigated compounds. However, the photoisomerisation is a reversible process and in the dark the thermal relaxation of Z isomer takes place. Based on the achieved data, the kinetic constants of the isomerisation and relaxation processes were calculated. It shows that conversion of the ester bond makes some changes in the optical properties. The shift of about 7nm of the absorbance maximum was observed. Surprisingly, the inversion of the ester group has significant influence on the liquid-crystalline polymorphism replacing one mesophase (for benzoates) into four (for alkanoates).

Słowa kluczowe

liquid crystals, azobenzene, UV–Vis spectroscopy, DSC calorymetry, photochromism, Smectics

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