A GREEN METHOD FOR DETERMINATION OF TOTAL ACID NUMBER IN OILS BY 4-HYDROXYSTYRYL DYES AS INDICATORS

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The quality of the various types of oils, biodiesel and similar products depends on production technology, raw materials, storage time and conditions, and so on. Evaluation of quality of oils realized by determination several parameters, for instance, acid number which is defined as the quantity mg KOH, necessary for neutralization of fatty acids in one gram of sample.

Our research deals with the investigation of new 4-hydroxystyryl merocyanine dyes as indicators for the determination of the total acid number (TAN) by titrimetric visual or instrumental methods. The 4-hydroxystyryl dyes, the derivatives of N-heterocyclic methylene bases (2-, 4-quinoline or pyridine, indolenine, benzothiazole, etc.), not very often used in chemical analysis. However, our investigation of its analytical, protolytical, colorimetrical and other properties demonstrates the good prospects for application the dyes for determination of molecular acidity or as microenvironment sensors.

The influence of heterocyclic and styrene fragments on absorption maximums, acidity constant (pKa) and solvatochromic shifts has been studied. Acidity constant (pKa) of synthesized dyes was observed in the range from 5 to 10 by spectrophotometric measurements. Molar absorption coefficients of merocyanine forms of studies dyes were much higher in organic solvents ($5\text{-}8\cdot10^4$ $l\cdot mol^{-1}\cdot cm^{-1}$) than aqueous ones. Coupled solvatochromic and protolytic shifts ($\Delta\lambda_{max}$) of 4-hydroxystyryl dyes are quite large (> 100 nm) what provide the opportunity to application as indicators for TAN determination of industrial or food oils. The best conditions analysis was observed. Proposed indicators are suitable for determination equivalent point in coloured samples and heterogenic aqueous-organic solutions. The elaborated method of acid number determination has been verified on several different objects (biodiesel, palm oil waste, transformer and others oils, such as sunflower, linseed, mustard, corn, olive). The experimental comparison of our visual and standard potentiometric method clearly shows that both procedures provide statistically equivalent results. However, the proposed method presents the significant advantages: more environmental friendly due to the use of less costly and less hazardous solvents, simpler to be performed and sufficiently accurate and reliable. Experimental procedure is greener than the known protocols and will be realized in manual colorimetric or automatic photometric variants.

In general, the studied 4-hydroxystyryl dyes have shown enormous potential for analytical and others applications due to interesting physical-chemical properties.

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