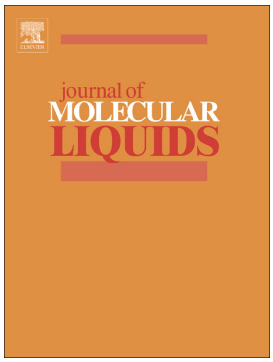

Influence of tetraalkylammonium halides on analytical properties of universal acid-base indicator paper

E.A. Reshetnyak, V.M. Ostrovskaya, K.V. Goloviznina, N.N. Kamneva

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INFLUENCE OF TETRAALKYLAMMONIUM HALIDES ON ANALYTICAL PROPERTIES OF UNIVERSAL ACID-BASE INDICATOR PAPER

Reshetnyak E. A.[1], Ostrovskaya V. M.[2], Goloviznina K.V.[1], Kamneva N. N.[1]

[1] V.N.Karazin Kharkiv National University, Kharkiv, Ukaraine; [2]Kurnakov Institute of General and Inorganic Chemistry of the Russian Academy of Science

Properties of three types of universal acid-base indicator paper (IP) obtained by means of noncovalent immobilization of five indicators (methyl yellow, methyl red, phenolphthalein, thymol blue, bromothymol blue) in the presence of tetraethylammonium chloride (TEAC) or tetrabutylammonium bromide (TBAB) and in the absence of salts were compared. It was proved that IP-TBAB has advantages in time stability of paper color, reliability of indicators retention in sorbent phase, and accuracy of visual determination of pH values using color scale. Values of acidity constants of indicators were determined by spectrophotometric method in water-ethanol solutions (mass fraction of ethanol is 50%) in the presence and absence of TBAB salt. It was found that modifying action of TBAB on properties of indicators in water-ethanol solutions and on paper is similar to influence of cationic surfactants. Examples of application of the indicator paper are given.

Key words: acid-base indicator paper; acidity constant; water-ethanol medium; tetrabutylammonium bromide; tetraethylammonium chloride; visual testing.

Introduction

Control of acidity of natural water and sewage, technological solutions, biological liquids is one of the most widespread and popular analytical operations. Different indicator systems (or pH-sensors) based on reagent solutions or sorbents with immobilized dyes are used for express determination of pH values of water media. Acid-base indicator papers [1-3] are best known to consumers; optically transparent solid matrix with fixed acid-base dyes have been suggested, for example, indicator films based on photographic hardened gelatin [4], agar-agar [5]; natural polysaccharide chitosan [6]; cellophane [7]; cellulose and cellulose triacetate on polyester base [8-10]; cassava starch plasticized by sucrose [11]; anodized aluminum oxide [12]; silica gel (sol-gel films) [13-20]; polymer obtained by crosslinking ionic liquid with acetonitrile [21]. Well-known azo dyes, phthaleins, sulphophthaleins and dyes of natural origin – anthocyanins [6, 11, 15], chlorophyll [11] were used as acid-base indicators. Indicators were fixed one at a time [2 -4, 7-13, 15-21] or from two [5, 6] to five [1] simultaneously on sorbent by means of noncovalent immobilization or chemical synthesis [1, 8-10, 21]. The increase in the number of immobilized dyes gave a possibility to extend pH range from two to eight units.