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Spectrophotometric determination of active chlorine by the color of indophenolic compounds

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Abstract

Chlorination is a method of disinfection and oxidation of organic impurities in water. Chlorine is present in aqueous solutions in various forms, which are formed as a result of the chlorination of water. Spectrophotometric methods are very important for determining small amounts of chlorine and its compounds. The article presents a modification of the classical indophenolic method. Determination of active chlorine should be carried out at room temperature, maintaining the solutions for 50 minutes, the pH range is 11.9 ± 0.1. The optimal concentration of reagents: 33-fold excess of *N*-phenanthranilic acid, 2-fold excess of sodium nitroprusside, and the concentration of ammonium chloride should be 4 to 7 times less than the concentration of active chlorine. The following interaction scheme was proposed: oxidation of ammonia to chloramine with hypochlorite, amination of *N*-phenanthanilate with the formation of sodium 4-amino-*N*-phenylanthranilate, oxidation of 4-amino-*N*-phenylanthranilate with sodium hypochlorite to an indamin compound, followed by complexation with sodium nitroprusside. The linearity range of the calibration curve is 1-23 mg/l, the convergence is 2.3%, the relative error is 1%. The molar ratios of ions and oxidizing agents present in natural waters that do not interfere with the determination of active chlorine are investigated. The optimal concentrations of reagents, sequential variation of the concentration of solutions and fixing the change in light absorption were established. The ratio of the stoichiometric coefficients according to the reaction equation was: ammonium: *N*-phenanthranilic acid: sodium nitroprusside: hypochloride was 1: 2: 1: 1. It is proposed to use this method to determine the active chlorine in tap water. It is recommended to use the calibration schedule to determine the preliminary content, and to establish a more accurate concentration, use the method of additives.

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