Abstract

This bachelor thesis deals with development, optimization and testing of the applicability of electrophoretic method for determination of ethanolamines in antifreeze mixtures. The method was tested with the coolant matrix. For the determination of ethanolamines in antifreeze mixtures a capillary electrophoresis with indirect UV detection was used. Ethanolamines – monoethanolamine, diethanolamine and triethanolamine – are organic compounds, which are used in antifreeze mixtures as corrosion inhibitors because glycols, which are often used in such mixtures, can be, after exposure to high temperatures or oxygen from air, transformed to acids that cause corrosion. The method was optimized by selection of the appropriate composition of background electrolyte, its pH, appropriate ratio of individual buffer components and selection of a suitable internal standard. Background electrolyte was a buffer composed of 60 mM acetic acid and 30 mM histidine, pH 4.59 and lysine was used as an internal standard. Silica capillary with an internal diameter of 50 µm, a total length of 50.0 cm and an effective length of 41.5 cm was used for measurements. Measurement at short end was tested, as well as shortening the capillary to 35.0 cm with an effective length of 26.5 cm, which was further used. The sampling was hydrodynamic at a pressure of 5 kPa per 3 seconds. The detection was conducted at the wavelength of 214 nm. The method may be used to determine ethanolamines over a concentration range of 0.005–1 mg ml⁻¹. The applicability of the method was tested by basic analytical parameters – repeatability, recovery, limit of detection, limit of quantification and linearity. The repeatability of peak areas and migration times for concentrations 0.06 mg ml⁻¹ and 0.6 mg ml⁻¹ range from 2 to 8 %. Significantly worse repeatability values occur at the concentration 0.06 mg ml⁻¹, which can be explained by the fact that at low concentrations the measurement is less accurate. Day-to-day repeatability is slightly higher, up to 19 %, indicating that the method needs to be calibrated every day to be considered accurate. Limits of detection for all three analytes range from 1 to 2 µg ml⁻¹ and limits of quantification range from 4 to 6 µg ml⁻¹.

Key words: capillary electrophoresis, ethanolamines, antifreeze mixtures