

Simultaneous Quantification of Glycols in New and Recycled Anti-Freeze Liquids by GC-MS

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Abstract : Glycol-based anti-freeze liquids, commonly composed of ethylene glycol or propylene glycol, have important uses in automotive cooling, but they should be handled with care due to their toxicity; ethylene glycol is highly toxic to humans and animals. A fast, accurate, precise, and robust method was developed for the simultaneous quantification of 7 most important glycols and their isomers. Glycols were analyzed from diluted sample solution of coolants using gas-chromatography coupled with mass spectrometry in single ion monitoring mode. Results: The method was developed and validated for 7 individual glycols (ethylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, propylene glycol, dipropylene glycol and tripropylene glycol). Limits of detection (1-2 µg/mL) and limit of quantification (10 µg/mL) obtained were appropriate. The present method was applied for the determination of glycols in 10 different anti-freeze liquids commercially available on the Romanian market, proving to be reliable. A method that requires only a two-step dilution of anti-freeze samples combined with direct liquid injection GC-MS was validated for the simultaneous quantification of 7 glycols (and their isomers) in 10 different types of anti-freeze liquids. The results obtained in the validation procedure proved that the GC-MS method is sensitive and precise for the quantification of glycols.

Keywords : glycols, anti-freeze, gas-chromatography, mass spectrometry, validation, recycle

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