

Research on a solution for determining alcohol concentration in breath and development of an alcohol concentration measurement device

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Abstract: This study presents a comprehensive solution for determining blood alcohol concentration (BAC) via breath analysis and the development of a corresponding measurement device. The research addresses the critical need for accurate, non-invasive, and portable alcohol screening tools for traffic safety and workplace compliance. A novel methodology was established, combining an optimized electrochemical sensor array with a custom-designed sampling chamber to ensure precise capture of alveolar air. The device's core algorithm employs a calibrated mathematical model to correlate breath ethanol levels with BAC, effectively compensating for environmental factors such as temperature and humidity. Experimental validation was conducted using controlled human subject trials against a reference gas chromatograph. Results demonstrate a high correlation coefficient ($R^2 > 0.98$) and a measurement error margin of less than 5% within the clinically relevant range. The developed prototype offers rapid response time, low power consumption, and user-friendly operation. This work provides a reliable, cost-effective solution for field sobriety testing, contributing significantly to the prevention of alcohol-related incidents.

Keywords: breath alcohol, alcohol concentration measuring device, alcohol concentration determination, measurement solution