

# COMPARATIVE STUDY OF WEARABLE ALCOHOL SENSOR THROUGH SWEAT

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## Abstract

A major objective of driving under influence is to protect the public and to ensure road safety. In India the death rate per year due to drink and drive is 80%. Even though the National Traffic Police Administration System has strict monitoring system for road safety the noninvasive alcohol sensor ensures and monitors safety limit of the alcohol consumption. This paper provides a comparative study of available wearable noninvasive alcohol sensors. The estimation and methods of alcohol detection is outlined in this paper.

**Key words:** Alcohol, Noninvasive, sensor

## I. INTRODUCTION

Unsafe levels of alcohol consumption can lead to vehicle crashes, violence, and the degenerated health of heavy drinkers. Such alcohol-related incidents and health concerns continue to rise rapidly across the globe, leading to considerable socioeconomic costs. Accordingly, there are tremendous needs for an accurate easy-to-use alcohol measuring device for use by law enforcement personnel, service/hospitality industry, or individual drinkers to provide a convenient means to monitor alcohol consumption. Although different methods have been used for determining alcohol consumption, including direct measurements of urine, blood, saliva, breath, or sweat, or verbal/interview measures, Blood Alcohol Concentration (BAC) is the most commonly used indicator of alcohol intoxication. 3–6 Unfortunately, blood samples cannot currently be obtained without penetrating skin, typically via a lancet pricking a finger or earlobe, which can be painful and inconvenient, and demands user compliance. Such blood sampling methods limit the general use of alcohol monitoring devices to the most extreme cases (e.g., law enforcement), rather than as a general-purpose tool that can monitor a user's alcohol levels and warn or prevent what could amount to a catastrophe. Accordingly, there are considerable demands for developing an alternative approach for measuring BAC indirectly in a noninvasive and real-time manner. Over the last several years there have been increased efforts to develop technology for blood alcohol testing, breathalyzing for drugs, and other innovations related to keeping people safe and helping keep drunk drivers and party-goers from engaging in risk behavior. There are cups that test drinks for being drugged. There are wrist-bands that monitor movement and keep friends connected when out and about. Every once in a while some new project emerges with the intent of protecting people who chose to drink and drug. Now, a new blood alcohol testing method is hitting the scene in the form of groundbreaking temporary tattoo technology. The sensor is a skin patch, and the patch is designed to monitor blood alcohol content. The device transmits the info via Bluetooth to a mobile-device in minutes. All this is with the idea of keeping people aware of their intoxication in real time.

## II.METHODOLOGY

### 2.1Alcohol detection using breath analyzer

Breathalyzers are the most commonly used alcohol detectors to measure the BAC approximately by measuring the alcohol in person's breath. Breathalyzers are portable hand held devices which are easy to handle and provide quick results. Breathalyzers consists of three parts: a mouthpiece, two glass vials containing chemical reaction mixture, and photocells to measure colour change. They are commonly used by law enforcement officers to check drunken driving on roads and highways .

In this machine, a suspect's breath is bubbled through one chamber of sulphuric acid, potassium dichromate, silver nitrate and water. The reacted mixture is compared to the non reacted mixture, causing a needle in the meter to move, which the operator must return to its resting place by a knob on the machine. The level of alcohol is determined by how much the operator must move the knob to return the needle to rest.

### 2.2Alcohol detection using sweat Tattoos for safety

This whole idea is a pretty impressive one when you put it in the context of safety. Since there is not much else on the market that could make the same boast about blood alcohol testing with accurate and on-the-spot info, this could be a new hope for the next level in public safety concerning drunk driving. In theory, someone could wear a patch when they go out for a night on the town. Then with an app they could keep track of their own BAC on their smartphone. It is another option in risk prevention, and might do more good than expected. "This device can use a Bluetooth connection, which is something a breathalyzer can't do. We've found a way to make the electronics portable and wireless, which are important for practical, real-life use". The tattoo works first by releasing pilocarpine to induce sweat via iontophoresis or amperometric detection of ethanol . Then, the sweat comes into contact with an electrode coated with alcohol oxidase, an enzyme that selectively reacts with alcohol to generate hydrogen peroxide, which is electrochemically detected. That information is sent to the electronic circuit board as electrical signals. The data are communicated

wirelessly to a mobile device. The advantages of tattoo sensor are Non-invasive blood alcohol monitoring in real time is a big challenge. Breathalysers do not directly measure blood alcohol and measurements made by existing commercial devices take several hours to produce results. In our device, we were able to show that by inducing sweating through an iontophoretic process, we can estimate blood alcohol concentrations in a matter of minutes rather than hours. What is more, we were able to develop the technology in a thin, conformal system that wirelessly sends information to a smartphone or watch, thereby making it much less bulky than existing products. The new device might be a promising alternative to breathalysers, which can sometimes produce "false positives". The device might also be adapted so that it can be connected to a vehicle's ignition interlock system. Someone whose blood alcohol concentration was above the legal limit would not then be able to start his or her car. It might also be a useful tool for bartenders and friends, quip the researchers.

### 2.3. Blood alcohol testing tattoo VS Breathalyser

According to reports, this method actually outshines breathalyzers when it comes to the accuracy of blood alcohol testing. That is because breathalyzers don't test the blood, they test the breath. So, they're actually not all that accurate. Breath tests are enough to give law enforcement probable cause, but they're not actually admissible in court. The reason this new test is such a big deal is because blood tests are not easily performed on the fly. Drawing blood is unpleasant to say the least, and would be a huge inconvenience when dealing with someone who's intoxicated. The new temporary tattoo blood alcohol testing method would change all this by accurately measuring an individual's BAC within a 15 minute period without needles.

## III. RESULTS AND DISCUSSION

We have demonstrated the first example of a completely wearable tattoo-based alcohol biosensor system, combining three important functions in a single wearable tattoo platform: sweat-inducing direct iontophoresis with amperometric enzyme biosensing, toward noninvasive alcohol monitoring from human sweat, along with a thin flexible printed electronic circuitry for controlling the entire operation and a wireless real-time data collection. The tattoo-based biosensor system provides reliable monitoring of alcohol consumption in real-world settings, as confirmed using a variety of control experiments. Such development of a low-cost single-use epidermal alcohol biosensor brings a highly useful tool for monitoring alcohol on our highways, in crime scenes, or in the workplace. The new sensor system could thus be fitted in vehicles to measure the drivers' blood alcohol concentration, and integrated with the vehicles' alcohol ignition interlocks to prevent driving while intoxicated.

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