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The Target Urine Volatile Organic Compounds Biosensor Platform for Genitourinary Malignancy Detection

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Objectives : Volatile organic compounds (VOCs) have been increasing in significance in recent years due to their pivotal role in the transition from invasive to noninvasive cancer diagnosis techniques. Despite numerous efforts, it is impossible to diagnose cancer in its early stages using a non-invasive method; as a result, new non-invasive techniques must be developed. The objective of this study was to evaluate VOCs as a biosensor for genitourinary cancer detection.
Methods : We selected five different commercially available semiconductor metal oxide sensors to detect all the targeted VOCs (methane, iso-butane, hydrogen, ethanol, hydrogen sulfide, ammonia, toluene, butane, propane, trimethylamine, and methyl-mercaptan. The electrical resistance changes of the temperature from the voltage heater were analyzed to prescribe a characteristic of VOCs metabolism. The logistic regression and ROC analysis of potential urine VOCs were analyzed and used for determination of genitourinary cancer.
Results : This cohort was conducted of 64 participants at SUT Hospital, Thailand. The participants were divided into two groups: a cancer group and a non-cancer group. The genitourinary cancer group (confirmed by tissue pathology) included 32 patients, consisting of renal cell carcinoma (3.1%), transitional cell carcinoma (46.9%), and prostate cancer (50%). The non-cancer group also had 32 patients, with 9 being healthy subjects and 23 having other genitourinary diseases, such as glomerular disease and BPH. The results indicated that VOCs sensor of methane, iso-butane, hydrogen, and ethanol groups, at a voltage heater of 2000 mV showed a significant prediction of genitourinary cancer with $p = 0.013$
Conclusions : Our data suggested that VOCs of methane, iso-butane, hydrogen, and ethanol groups had the potential to diagnosis genitourinary cancer. The development of gas metal oxide sensors tailored to these compounds by monitoring changes in electrical resistance could serve as an innovative tool for identifying this type of cancer.

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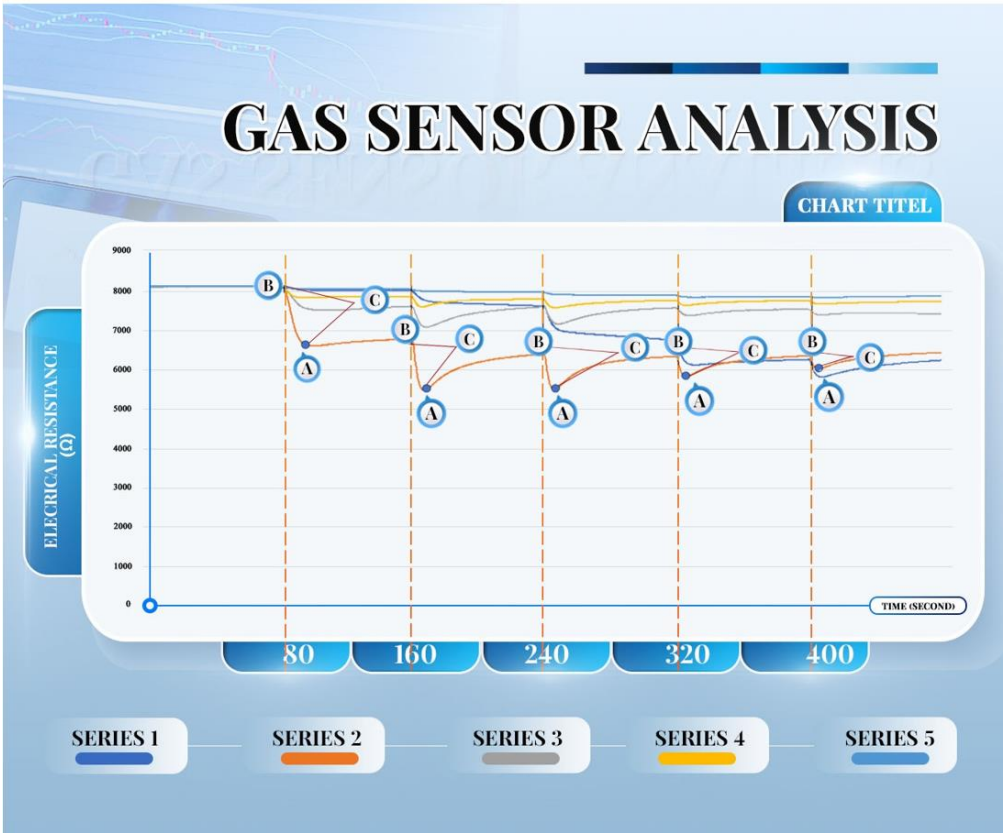

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