

Development and evaluation of a MOS-based electronic nose for accurate discrimination of chronic obstructive pulmonary disease using breath analysis

Abstract: This research paper presents a novel approach for discriminating chronic obstructive pulmonary disease (COPD) patients from smokers and healthy controls using a self-made electronic nose device. The study aims to develop a portable and user-friendly system that accurately identifies COPD patients based on volatile organic compound (VOC) profiles present in their breath. Breath samples were collected from 25 COPD patients, 32 smokers, and 36 healthy controls. The MOS-based electronic nose device incorporated a sensor array consisting of TGS 2600, TGS 2610, TGS 2620, TGS 822, and TGS 826 sensors. Advanced signal processing techniques, including independent component analysis (ICA), were employed to analyze the breath samples and extract relevant features. Three classification models, namely Support Vector Machine (SVM), Naive Bayes, and Decision Tree, were utilized to discriminate between COPD patients, smokers, and healthy controls based on the extracted features. The results demonstrate the efficacy of the self-made MOS-based electronic nose device in accurately discriminating between COPD patients, smokers, and healthy controls. The SVM model achieved a remarkable accuracy of 85.25% and an area under the curve (AUC) of 87%. This study highlights the potential of breath analysis as a non-invasive and cost-effective approach for COPD diagnosis and differentiation. The findings provide a solid foundation for further research and the development of non-invasive breath analysis techniques in the field of respiratory disease diagnosis and monitoring.