

## Recent progress in the development of non-MEMS MOS gas sensing platform at NECTEC-NSTDA

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### Abstract

Since late 2017, we had publicly presented a non-MEMS gas-sensing platform, namely GASSET, which can support a variety of metal oxide semiconducting (MOS) gas-sensing materials for the real-world applications. The device has many advantages including low operating power, maskless sensing film coating process and no need of expensive MEMS facilities, which is presently the state-of-the-art technology for fabricating the commercial low-power MOS-type gas sensors. However, there were some limitations of the low maximum operating temperature of 250 °C, limited temperature uniformity on sensing area and limited temperature processability due to the chip holding material. In this work, we report the solutions to these problems via the use of different titanium nitride (TiN) sputtering processes and electrode redesign. The quality of titanium nitride heater-film has been improved with the use of upward sputtering process and the optimization of sputtering process parameters. The resulting TiN films display substantially improved quality with ability to operate at a temperature higher than 350 °C. Moreover, with alumina chip-holder, the device can now be processed at a higher temperature of 400 °C for long period with no change in electrical properties. In addition, the electrode was redesign to obtain better temperature uniformity over the sensing area. Therefore, the improved GASSET platform will allow wider utilization of MOS gas-sensing materials in commercial applications.

*GASSET; gas sensor; metal oxide semiconductor; platform*