

## An array of semiconducting metal oxide heterojunction sensors used for explosive detection

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Terrorists frequently use explosives and they represent an imminent threat to national and global security. Recent events highlight the necessity of explosive detection, demonstrating the need for developing and applying new sensors for explosive gas detection. Semiconducting metal oxide gas sensors can be incorporated into electronic noses, which provide a cheap, portable and highly sensitive device, therefore making them a reliable method when detecting explosives. Using unmodified, admixed and 2-layered sensors consisting of WO<sub>3</sub> and CTO (chromium titanium oxide) an array of seven heterojunction semiconducting metal oxide sensors was produced. All seven sensors were tested

against gases associated with explosive materials at a range of temperatures 300°C, 400°C and 500°C. All sensors produced underwent X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Energy-Dispersive X-ray Spectroscopy (EDX) and Raman spectroscopy, in order to establish if any structural changes occurred to the array due to the exposure of the gases or temperatures. Both the admixtures and the 2-layered semiconducting metal oxide gas sensors have been shown to enhance sensor response when detecting explosives. The data collected was processed against a support vector machine in order to comprehend the sensors application into an electronic nose. The technique produced a high data classification when classifying the gases used within the study. Therefore, the array produced has successfully discriminated the tests gases from one another, consequently showing the potential use of the array implemented into an electronic nose for the use of explosive detection to be an effective method.

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