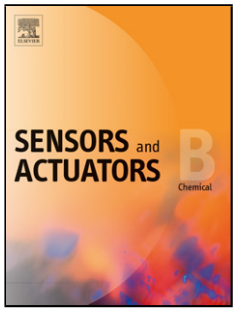

Title: Self-powered smelling electronic-skin based on the piezo-gas-sensor matrix for real-time monitoring the mining environment

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Keywords: Flexible; Self-powered; Gas sensor; Real-time monitoring; Electronic-skin

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Abstract: A flexible self-powered smelling electronic-skin (e-skin) for real-time monitoring the mining environment has been fabricated from piezo-gas-sensor matrix of ZnO-based composite nanowires (NWs) via soft photolithography technique. The e-skin includes four sensing units (relative humidity: bare ZnO NWs, ethanol: Pd/ZnO NWs, hydrogen sulfide: CuO/ZnO NWs, and methane: TiO2/ZnO NWs) and can cross-reactively detect relative humidity (RH), ethanol, hydrogen sulfide (H2S) and methane (CH4) in the surrounding gas atmosphere without external electrical power supply or battery. The e-skin attached on human body can be driven by body motions, and the piezoelectric impulse of the piezo-gas-sensior matrix serves as the power supply. The responses of the four sensing units are 87.76% against 90% RH, 59.82% against 1000 ppm ethanol, 79.27% against 500 ppm H2S and -87.50% against 500 ppm CH4, respectively. High response, selectivity and stability have been achieved from the sensing units. The present results could provoke a possible new research direction for promoting the practical application of flexible self-powered smelling electronic-skin in specific occasion.