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UHV Studies of Oxygen's Role in Hydrogen Sensing with a Platinum-Gate Silicon Carbide Field-Effect Device ROGER TOBIN, Tufts University, YUNG HO KAHNG, Korea Research Institute of Standards and Science, REZA LOLOEE, RUBY GHOSH, Michigan State University — Silicon carbide-based field-effect devices with catalytic metal gates are promising as robust high-temperature gas sensors in harsh environments. We report ultrahigh vacuum studies of the gate surface chemistry of prototype Pt-SiO_2-SiC sensors. Oxygen plays a crucial role in the device's hydrogen-sensing behavior. Adsorbed oxygen can remove hydrogen by reacting to form water, which rapidly desorbs. In an oxygen-rich environment this reaction competes with the diffusion of adsorbed hydrogen to the interface bonding sites that give rise to the sensor signal. This competition reduces the sensor signal by decreasing the occupation of interface sites. The same reaction, however, is essential to the reversibility of the sensor, as oxygen is needed to fully deplete the sensor of hydrogen. Exposure to H_2S suppresses the sensor's response to alternating hydrogen and oxygen pulses, apparently by interfering with oxygen adsorption. Continued oxygen exposure, however, restores functionality by effectively removing the sulfur.

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