GaN-based potentiometric sensors

The Gallium Nitride (GaN) semiconductor has been used as the sensing element in a chemical sensor for the measurement of charged species in solution. The sensor shows remarkable selectivity for anions and the recognition mechanism is based on the selective interaction of anions in solution with the epitaxial Ga-face polarity GaN (0001) wurtzite crystal film grown on sapphire. The potential is based on the Volta potential, generated at the gallium/solution interface and within the Helmholtz layer, due to specifically adsorbed anions while the selectivity of the sensor is based on the direct interaction of the anionic ligand with the outer electron defective gallium atoms. This selective interaction has been probed using both impedance and zero current non-Faradaic electrochemical measurements. The sensor shows remarkable signal reversibility and signal stability over time, supporting the surface fixed site model. The high stability of the GaN-based sensors, combined with the ability for miniaturization allows for their application in nanofluidic systems and direct anion selective CHEMFETs.

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