The Use of Reduced Graphene Oxide in Fluorinated Phthalocyanines and Their Applications in Gas Sensing

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Gas sensing is vital for human health, industrial safety, and adherence to air quality standards (Tonezzer & Van Duy, 2023). Metal phthalocyanines (MPc's) are promising gas sensing candidates due to their stability and coordination bonding with metals. The gas-sensing capabilities of MPc's are enhanced by fine-tuning metal centers and molecular structures (Flores et al., 2022). This research explores the use of Fluorinated Iron Phthalocyanines (FePcF16) for the detection of the toxic gas NO2. FePcF16 is very accurate in measuring low concentrations of toxic gas, but phthalocyanine gas sensors have low conductivity that limits sensitivity and selectivity. To address this, FePcF16 was synthesized and dispersed in dimethylformamide; reduced graphene oxide (rGO) was added to this mix, and the graphene oxide was reduced with ammonia water and hydrazine. This was later purified creating a new FePcF16-rGO hybrid. This new hybrid was characterized using X-ray diffraction, UV-spectroscopy, and Raman Spectroscopy; it was tested in NO2 gas sensing using a sealed chamber and a picoammeter. The addition of the rGO into FePcF16 significantly boosts sensor current, improving sensitivity and selectivity. The hypothesis was proven true, increasing sensor conductivity response up to two orders of magnitude.

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