Using Light Emitting Diodes as Light Sensors for the Detection of NO2

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This project aimed to develop and test an inexpensive and effective detector of NO2 using LEDs (Light Emitting Diodes). I hypothesized that an LED that was configured as a light sensor would respond to changing levels of NO2. In theory, the LED's output voltage would decrease as concentrations of NO2 increased, because NO2 absorbs light at specific wavelengths. The response should be especially apparent in LEDs which detect light within the wavelengths of the absorption peak of NO2 (~ 300 - 550nm). I built two circuit boards, measured the detection ranges of all LED sensors on the first version of the sensor with the use of a monochromator and an oscilloscope, and recorded output voltages for both versions of the board when they were exposed to the sun on days with varying concentrations of NO2 as determined by a state air monitoring station. I also conducted tests with my second circuit board to determine if it could detect changes in the amount of NO2 in vehicle exhaust over time. The data collected with the monochromator and oscilloscope showed that LEDs can detect light in specific wavelength bands. In addition, some LED readings from both boards showed a decrease as the concentrations of NO2 increased. In the vehicle exhaust test, the data collected from the LEDs correspond closely to NOx concentration data collected simultaneously by an emissions monitoring system. All of the data that I have collected thus far suggest that LED sensors can detect NO2.

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