Leveraging Electrochemistry and Light Scattering to Improve Air Quality Detection

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With an estimated 6.7 million people dying from air pollution annually, and millions of others suffering from illnesses that are either caused or exacerbated by this epidemic, the AQI has become an integral part of our lives, especially for low-income communities that are disproportionately targeted by suboptimal air quality. Yet, with the AQI using 24-hour long averages, distilling too much information into one datapoint, leaving out CO2 concentrations, and not providing actionable advice, much is left to be desired. The project caters to these shortcomings by instituting the MG-811 sensor, which uses electrochemistry to detect CO2 concentrations, and the PMS5003, which uses light scattering and is able to differentiate between PM1, PM2.5, and PM10. The sensors are interfaced through the Arduino MEGA board, and an integrated algorithm asks the user two questions. The first one asks the user if they have any respiratory complications, which automatically lowers the thresholds for the values' interpretations; and the second question, which asks the user if they're indoors or outdoors, allows for precision in interpreting CO2 values. (It is common for CO2 values to be higher indoors than outdoors). Moreover, AQI monitoring stations are expensive, with some going up to $10,000. Using Arduino circuitry, the project manages to bring the cost down to $85, a massive cost reduction, even when compared to the relatively cost-effective Temtop M2000.

Awards Won:
U.S. Agency for International Development: Third Award Climate and Environmental Protection