Simple and Inexpensive Method for Measuring Ozone Concentration Using Sodium Nitrite

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In recent decades, due to rapid industrialization in many developing countries, there have been increased emissions of photochemical oxidants, whose main component is ozone. High ozone concentrations have a negative influence on both human health and plant growth. In Japanese cities, municipal officers monitor ozone levels. However, the ozone measuring devices currently being used are very expensive, and require an electrical power source. In this study, we developed an easy approach to measuring the ozone concentration in the atmosphere based on the use of $NaNO_2$ and the well-known Saltzman method. The proposed method requires no electric power supply and is inexpensive, costing approximately 0.4 U.S. dollars per device. In the modified approach used here, filter paper soaked in $NaNO_2$ solution was placed outdoors for a predetermined time, so that the $NaNO_2$ reacted with ozone in the atmosphere. Salzmann reagent was then added to the filter paper, and the absorbance at 545 nm was measured to determine the amount of unreacted $NaNO_2$. The results were compared with ozone concentration data released by the municipal office in Osaka Prefecture , and a proportional relation was found between the two. In addition, we produced ozone concentration map using 39 simple air samplers in the northern part of Osaka Prefecture. Over a period of 120 hours, and the results were found to be consistent with values released by the municipal office. Hence, the proposed method is an effective and inexpensive means of monitoring ozone concentrations.