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參展科別 化學

作品名稱 Development of a Method for Measuring  
the Ozone Concentration in the  
Atmosphere Using Passive Method

得獎獎項 二等獎

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# Abstract

## 1. Introduction

Passive method is widely used for measuring air pollutant for one day to several weeks. This method can be used easily and doesn't need electricity, but expensive devices are needed for measuring substances, so this is not suitable for high school students for measuring or investigating. Then, we focused on the reaction, in which Indigo, the blue pigment, is discolored by ozone, and we built up a hypothesis, that indigo is suitable for measuring ozone concentration.

## 2. Experimental Section

We soaked a 10 mm×20 mm filter paper in an indigo solution, including phosphoric acid. Then, they were dried in an automatic oven. 5.5 cm×10 cm PTFE sheet was fold in two and five sheets of indigo filters were fixed inside (passive sampler). The passive samplers were fixed on a stand and exposed to ozone in the atmosphere. After a few days, we collected the samplers and put each indigo filter and 4.0 mL of ion-exchange water into sample tubes. Then we shook this and extracted the color pigment. We had the average value of 600 nm from the five sheets as a measure value.

## 3. Results and Discussion

The total amount of ozone for one to seven days measured in the experiment was directly proportional to the amount of ozone measured by Osaka Prefecture. We found that we can measure ozone in atmosphere using our method. Passive method has an advantage: it can be carried out easily. We employed this trait and measured ozone concentration at 23 points simultaneously in the north of Osaka for 48 hours. We made the map of ozone concentration by marking on a blank map. The map we made was just

like the map published by Osaka Prefecture. We expect that this method will be useful in measuring ozone, where measuring devices are not available.

#### 4. Conclusion

We succeeded developing new method for measuring ozone in the atmosphere by passive method using indigo, the blue pigment.

## 評語

The authors use passive method to measure air pollutant from one day to several weeks. The advantage of diffusion method is without a pumping system, but it takes longer period to accumulate enough amount of pollutants for analysis. The suggestion is to make comparison active and passive methods.