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Establishment of Quantification Method of Salt by Microwave -Emission Analysis by Means of Hot Spot Produced by Irradiation-

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Summary

Introduction

Luminescence by the bubble collapse in solvent is called 'sono-luminescence'. For example, ultra-sound is irradiated to solvent, and fine bubbles are produced. This bubble has higher potential because it is broken by self-pressurizing effect. In this case, the bubble becomes higher pressure and higher temperature, which are enough for decomposition of water molecule, when bubble collapses quickly and adiabatically. Finally, OH radical is produced by the thermal excitation of the bubble collapse, and it used for the luminescence behavior. Our previous study found that microwave caused fine bubble efficiently and the radical might be produced as well. The convection happened during the irradiation at the same time, and it is useful for getting homogeneous distribution of ion. Accordingly, we thought that this characteristic of microwave is used for the luminescence as well as ultra-sound.

Experimental

First, microwave reactor is set up so as to observe the solution color during the irradiation by placing camera on the side of the reactor. Secondly, microwave is irradiated to a solution with iron ion for prediction of the concentration through the captured movie. Finally, luminescence behavior is observed under microwave for the power (Exp. 1) and the different concentration (Exp. 2).

Results and discussion

(Exp. 1). Exffect of power

Relation between intensity and time, bright solution was obtained during the irradiation. The maximum brightness during the irradiation is related with the power. For exmaple, 30 W is not enough for luminecence beharvior, and around 180 W is moderate to get bright color of the solution. The relation between the power and the brightness showed the posibility of prediction of ion concentration by microwave irradaition. Higher power is effecttive for getting bright solution. However, boiling behavior must be cared because the detection of the color became impossible.

(Exp. 2). Effect of concentration

Bright color of solution was obtained for not only higher concentration (0.1 wt%) but also lower concentration (0.0001 wt%). In particular, detection of the lower concentration is interesting because microwave irradiation accelerated luminescence behavior of ion. According to the profiles of brightness of the solution, it was found that short irradiation time (2 s) of 180 W is moderate as preventing the boiling behavior, appropriate

irradiation condition was decided for the detection. In this case, pulse irradiation is not necessary for the detection.

Conculusion

In this study, possibility of concentration detection of iron was shown during the irradiation. However, accuracy of the detection must be solved as a problem. Moreover, more investigation of different type of ion except for iron must be required for the application of this method. Detection of subtle luminescence is necessary by means of optical detection measurement like photo-multiplier.