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Acceleration of Photocatalytic Antibacterial Action of TiO₂ by Halide Ions against Oral Microorganism

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1 INTRODUCTION

The photocatalytic activity of semiconductor powders has been investigated in such heterogeneous photocatalytic processes as hydrogen production from water¹⁾, decomposition of waste organic chemicals²⁾, reduction of carbon dioxide³⁾, various organic chemical syntheses⁴⁾ and bactericidal action against some bacterial species⁵⁾.

We have communicated that powdered TiO₂ semiconductor has a photocatalytic effect on dental plaque and inhibits the viability of *Streptococcus mutans*, when reaction mixtures are irradiated with UV light^{6,7)}.

In the present paper, we describe the prominent acceleration of photocatalytic antibacterial action of powdered TiO₂ semiconductor by some halide ions against oral microorganism.

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2 EXPERIMENTAL

Experiments were made with the fine-grain TiO₂ particle (P-25, Nippon Aerosil Co., LTD.) which is composed of 70% anatase and 30% rutile.

The stationary culture of *S.mutans* FA-1 was carried out in Brain Heart Infusion broth (BHI broth, Difco Lab.) at 37°C for 24 hours. The culture (5×10⁻³cm³) was suspended in 100 cm³ of an aqueous solution of halides containing 0.1% TiO₂ by weight.

For the experiment of photocatalytic antibacterial effect, a glass vessel with bacterial suspension was set 5 cm apart from the light source and irradiated with a fluorescent lamp (FL20S-BL, Toshiba Corp.).

The viable cell count was measured by counting the colonies with a smear method using BHI agar.

3 RESULTS AND DISCUSSION

In the previous paper⁶⁾, we have demonstrated the following conclusions, (1) photoexcited surface on powdered TiO₂ semiconductor contacted with a liquid phase has an excellent bactericidal capacity against *S.mutans* which is one of oral microorganisms, (2) the photocatalytic antibacterial action is more effective under near-ultraviolet irradiation than under visible one, (3) in this effect, anatase TiO₂ is superior to rutile TiO₂.

Here we report that the photocatalytic