

catalyst than silica gel⁷ (Merck 7734), Fluorosil[®] and Montmorillonite K10[®]. Slight excess of kaolin did not give any side products and showed no effect on percentage yield. However condensation with ketones did not give satisfactory results, even after heating at 50°C for 10 hr.

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FORMATION OF H₂O₂ ON RUTILE TiO₂ DURING PHOTO-ILLUMINATION OF OXYGEN

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PREVIOUS studies^{1,2} on the adsorption of water on titanium dioxide have shown that molecularly adsorbed water is bound to the surface in addition to hydroxyl groups. Sufficient evidence is available to support the strong relationship existing between surface bound hydroxyl groups and photoactivity of titanium dioxide³. The presence of these OH groups may lead to their combination in pairs to form hydrogen peroxide. But there is little evidence available to show that H₂O₂ is formed during photoadsorption of O₂ on TiO₂. However, its participation during photocatalytic reaction on TiO₂ has been reported⁴⁻⁶. This communication investigates further to show the formation of H₂O₂ as an intermediate through the photostudy of O₂ on TiO₂ surfaces.

The adsorption-desorption experiments were performed in a conventional high vacuum system. The samples were irradiated with UV light using water-cooled medium pressure mercury arc (Hanovia, 500 W). The temperature programmed desorption (TPD) experiments were performed in conjunction with a proportional temperature controller. The desorbed species were analysed by a mass spectrometer (VG Micromass 2A).

It is reported⁷ that the decrease in photouptake of O₂ with increasing outgassing temperature between 273 K and 693 K is due to the decrease in surface OH groups. The participation of OH groups in photo-adsorption of oxygen on TiO₂ is further supported by the observation that the strongly bound OH groups on TiO₂ are affected under normal illumination in the presence of oxygen while, in the absence of oxygen, the OH groups remain unaffected⁸.

Temperature has a pronounced effect on oxygen photo-adsorption on TiO₂. The effect observed is shown in figure 1 which indicates a complex behaviour with a maximum around 323 K. The equilibrium uptake of O₂ increases from 273 K to 323 K, having a maximum at 323 K and then decreases abruptly. The gradual increment of O₂ uptake between 273 K and 323 K reflects the conversion of OH ions into OH radicals on TiO₂ since evidence for the photocatalytic formation of surface hydroxyl radicals on TiO₂ has been reported^{9,10}. The existence of these OH radicals may lead to their combination to form H₂O₂. The increase in the surface concentration of H₂O₂ remains thermally

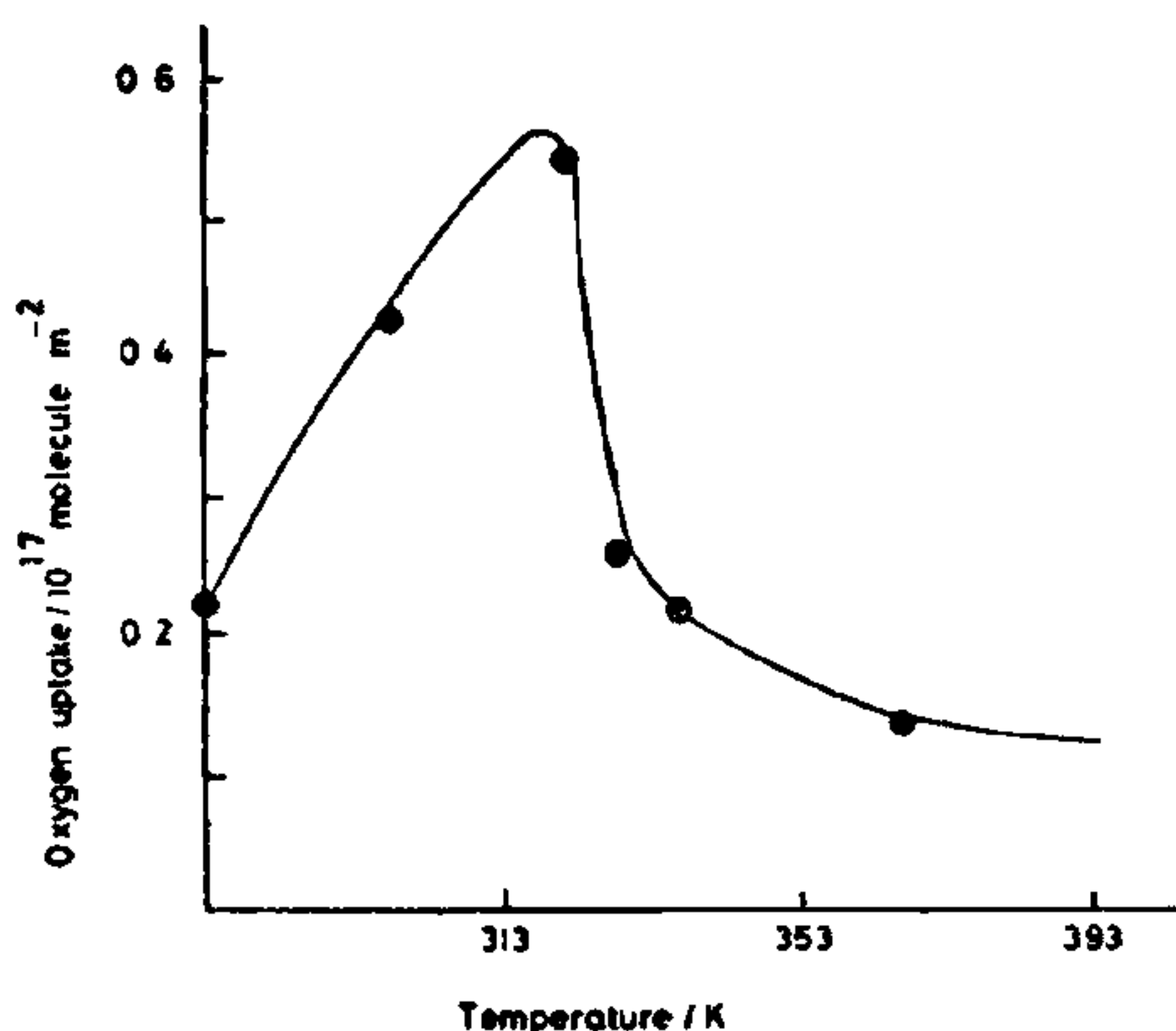
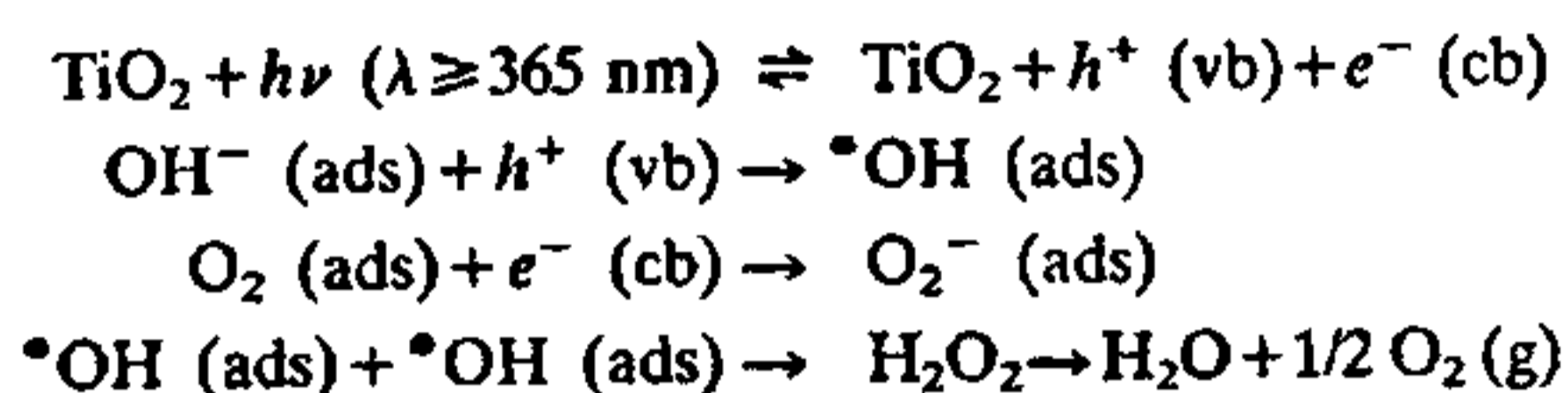


Figure 1. Effect of temperature on the photo-adsorption of oxygen on titanium dioxide.

stable until 323 K. The sharp decrease in uptake from 323 K suggests the decomposition of H_2O_2 molecule giving rise to O_2 as one of the desorbing products. It is further observed that the temperature at peak maximum (323 K, figure 1) agrees well in position if not in intensity to the desorption profile of O_2 produced from TiO_2 surface moistened with H_2O_2 . The formation of H_2O_2 and its decomposition on TiO_2 may proceed as follows:



The fractional pressure dependence of oxygen photo-adsorption⁸ indicates that both photo-adsorption and photo-desorption of oxygen are two simultaneous processes having opposite effects.

In conclusion, it is said that hydrogen peroxide is formed as an intermediate product during oxygen photo-adsorption on TiO_2 surfaces and is thermally decomposed at 323 K to give O_2 as one of the products.

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SPONTANEOUS MUTATION TO O/129 RESISTANCE IN *VIBRIO PARAHAEMOLYTICUS*

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COLLIER *et al*¹ reported the vibriostatic activity in a series of 2-4 diamino 6-7 dialkyl pteridines of which 6-7 diisopropyl pteridine (O/129) had the maximum activity. Shewan *et al*² described the usefulness of O/129 sensitivity test in differentiating vibrios from *Pseudomonas*. Subsequently, the importance of O/129 susceptibility test in differentiating vibrios from other gram-negative bacilli has been emphasized by several workers³. Bian and Shewan⁴ went to the extent of recording their belief that all O/129 sensitive gram-negative bacilli belonged to *Vibrio* spp. However, Sundaram and Murthy⁵ reported incidence of O/129 resistance in human isolates of *V. cholerae*. In *V. parahaemolyticus* Arai *et al*⁶ demonstrated O/129 resistance associated with resistance to other antibiotics like chloramphenicol, tetracycline, streptomycin, kanamycin, ampicillin and trimethoprim. Since O/129 sensitivity is one of the criteria for identification of *V. parahaemolyticus*, any mutation to resistance, would be of taxonomic significance. Since a small percentage of the natural isolates examined in this study was resistant to O/129, the frequency of spontaneous mutation to resistance, the stability of the resistant character and any phenotypic alterations accompanying mutation to O/129 resistance were examined.

Single colonies of O/129 sensitive and resistant isolates were used in the experiment. They were inoculated to 5 ml trypticase soy broth with 1% sodium chloride (TSBS) and after overnight growth were diluted and plated on trypticase soy agar containing 1% sodium chloride (TSAS) by spread plating 0.1 ml quantities. From the dilution showing isolated colonies between 30 and 300, 100 colonies were picked up and inoculated to TSBS and a young 6 hr culture was examined for sensitivity to O/129 to study the frequency of mutation and subsequently any frequency of reversion. The representative sensitive and resistant colonies of a particular strain were examined for sensitivity to other antibiotics like streptomycin, chloramphenicol, terramycin, kanamycin, gentamycin, nitrofurantoin, gremoneg and septran. The colonies were also tested for any change in biochemical characters such as fermenta-