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PROGRESS REPORT MARCH 31, 1989 - JUNE 30 1989

(a) Principal Investigator : Prof. O.A. Ileperuma

(b) Address : Institute of Fundamental Studies, Hantana Road, Kandy, Sri Lanka.

(c) US AID Project Number : 936 - 5542

(d) Title of the Project : Photofixation of dinitrogen on semi-conductor Catalysts

(e) Research Assistant : Mr. J.M.S. Bandara
Miss. C.T.K. Thaminimulla

Progress during the period

The work on TiO_2/WO_3 system as a possible photocatalyst for converting N_2 to NH_3 was completed during this period. As reported in the earlier report, the optimum conditions for the preparation of the catalyst were : heating time, 2h, heating temperature 250°C, and a pH of 8. The catalyst was prepared by suspending TiO_2 in a solution of sodium tungstate which was carefully acidified. Under these conditions H_2WO_4 is deposited on the TiO_2 particles. Upon heating this dehydrates giving a fine coating of WO_3 on the surface of TiO_2 particles. The process of making this catalyst as described above is important for the photocatalytic activity of TiO_2 since it was found that simple mechanical grinding of TiO_2 with WO_3 gave no active catalysts.

Despite our expectation of developing a cyclic system for N_2 reduction with this catalyst, it was found that the activity decreased with time. The yields were also similar to those obtained earlier by other workers and our research group. On

further investigation of this system using X-ray powder diffractometry, we observed the formation of an inactive bronze type of compound which can be best described as "$W_{24}O_{68}$". This form is inactive toward N_2 fixation. Further work on ways of preventing this bronze formation and to obtain the more reactive $WO_{2.96}$ with the present system is also under study.

Investigation on the use of heteropoly acid salts of phosphorus, Molybdenum and Tungsten have been started. There are some difficulties in coating these compounds on TiO_2 substrates. Some of these systems involving silicotungstates and silicomolybdates seem to be inactive toward N_2 reduction. Further work along these lines is in progress.

Work was also begun on the possibility of devising a new cyclic system based on CeO_2/TiO_2. Ceric salts have been studied for a number of years as a possible candidate for water splitting. The possibility of combining the desirable photoredox properties of the ceric/cerous system and the semiconducting properties of titanium dioxide will be investigated.

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PROGRESS REPORT DECEMBER 31, 1988 TO MARCH 31, 1989

(a)	Principal Investigator	:	Dr. O.A. Ileperuma
(b)	Address	:	Institute of Fundamental Studies, Hantana Road, Kandy Sri Lanka
(c)	US AID Project Number	:	936 - 5542
(d)	Title of the Project	:	Photofixation of dinitrogen on Semiconductor catalysts
(e)	Research Assistant	:	Mr. J.M.S. Bandara

PROGRESS DURING THE PERIOD :

During this period work continued on the composite catalysts of TiO_2/WO_3. Conditions such as heating time of the catalyst, heating temperature pH, depant level etc. It was found that a heating time of 2h, heating temperature of 250°C and a pH of 8 are optimum for N_2 photoreduction. Further work on loading TiO_2 with heteropoly acid salts of Phosphorus, Molybdenum and Tungsten are in progress.

Other remarks :

Although several interviews were held it was not possible to find suitable candidates for the remaining research assistant posts. Another drawback for satisfactory progress was the delay in receiving the equipment ordered from abroad.

No administrative changes are anticipated.

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