CONFIDENTIAL RESTRICTED

C
O
P
Y

729939

M.I.T.
Cambridge, Mass.
March 24, 1942

R

Prof. C. C. Furnas
National Defense Research Committee
1530 P Street NW
Washington, D. C.

Dear Prof. Furnas:

The activity-life test on the Co-Sa-En material has been discontinued after 4400 cycles. The results of this study are presented in the attached plot. This plot gives the results for 4400 cycles. The final activity was about 25 per cent. In addition to the activity test, the saturation was determined at the end of the 4400 cycles. This saturation value was likewise about 25 per cent of the original saturation, indicating that the loss in activity and saturation are about comparable and that the active material left must be less active than the original material since the oxygen removal is less in the later runs. I do not believe that the plot of these data shows any indication of becoming asymptotic and the few changes in curvature are apparently due to scattering of the data.

The fact that the curve of activity versus the number of cycles is essentially a straight line must be very significant and should give some insight into the cause for the loss in activity. It would still appear that some constituent in the entering air would be the most logical explanation. We feel that a series of studies of this type would furnish the basis for improving the activity-life characteristics.

The deactivated material from this study is being divided into three portions, one of which will be sent to Professor Calvin for X-ray tests, a second portion will be sent to Professor Diehl for complete chemical analysis, and we plan to try reactivating the third portion by the method of Professor Diehl, i.e., by heating to 195°C. under a high vacuum.

Mr. Roberts suggested that desorption runs in which the rate of heat supply was constant would be useful in the design of the self-contained units. We have made a few runs under such conditions in the usual 1/2" i.d. tube. This tube was arranged with a double jacket. The outer jacket was supplied with steam at atmospheric pressure and steam at a constant, measured rate was introduced into the annular space between the outer jacket and the desorption tube. The outer jacket was employed in order to prevent heat loss. The results of three such runs are summarized in Table I. In the first run a relative low rate of heat supply was employed and the unit took this constant

CLASSIFICATION CANCELLED OR
CHANGED TO Undersigned
BY AUTH. CG DAR-1 4.31
BY David L. Avery ADC DATE 4/1/96
By T E Gretlock ADD 3/15/96

1262398

rate for 6.25 minutes and desorbed 97 per cent of the oxygen. The second run was at a somewhat higher rate of heat supply and at the end of 3-3/4 minutes the unit refused to take the rate of steam flow. In this run 82 per cent of the oxygen was desorbed during the constant heat supply portion. In the last run a still higher rate of heat supply was employed and the unit operated at this constant rate for 2-2/3 minutes, and a desorption of 56 per cent was obtained. On the basis of previous results it is estimated that in the case of the second run about 2 minutes additional time with a decreasing rate of heat supply would give essentially complete desorption and for the last run the additional period would be about three minutes.

While the rate of desorption under these conditions of constant rate of heat input is somewhat lower than was obtained with excess steam supply, the additional time required to complete the desorption is not very great. With excess steam about 4 minutes would be required for essentially complete desorption, while about 6 minutes would be required with a constant rate of heat supply.

A few absorption runs have been made in order to evaluate the possibilities of operating at higher temperatures and pressures. If reasonable absorption rates can be obtained under these conditions, it should be possible to develop either an essentially isothermal or adiabatic process, either of which would greatly reduce or entirely eliminate the sensible heat load, and hence such high temperature operation might be very advantageous. These preliminary runs are summarized in Table II and they indicate that an increase of the absorption temperature to 50°C. can be overcome by an increase in pressure. In addition, a series of desorption runs are being carried out at various constant temperatures and desorption pressures. These runs should indicate the temperature region that is feasible for adiabatic or isothermal operation. Absorption runs in this temperature region will then be carried out.

E. R. Gilliland

1262399

TABLE I

Constant Heat Supply

Run	Rate of Heat Addition Btu per minute	Time of Heat Absorption at constant rate min.	Weight % Oxygen desorbed Under constant rate of Heat absorption	Total Wt. % Absorbed	Percentage Desorbed under Constant Rate	Total Btu Added to End of Constant rate Period
I	2.36	6.25	2.55	2.64	97%	14.8
II	3.67	3.75	2.21	2.68	82%	13.7
III	4.91	2.67	1.37	2.44	56%	13.1

1262400

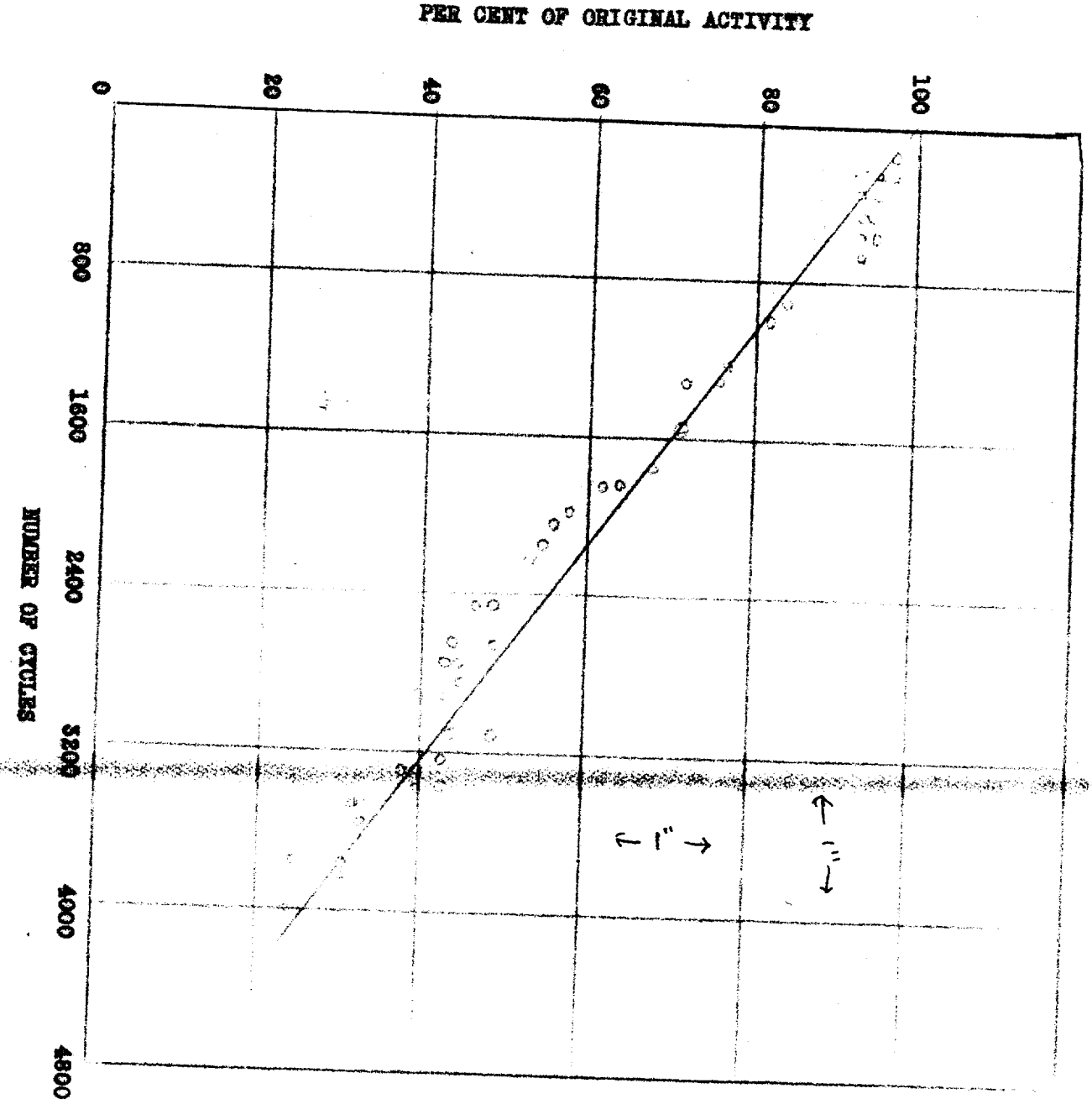
TABLE II

Absorption Tests at 50°C.

(40.7 gms. Absorbent)

Air Pressure lbs./sq.in. ga.	Absorption Time Minutes	Air Rate C.F.H.	Absorption Wt. % Oxygen
300	1	8.2	0.25
300	6	8.2	3.10
470	2	16.0	3.41

1262401


PER CENT OF ORIGINAL ACTIVITY
100
80
60
40
20
0
800
1600
2400
3200
4000
4800
NUMBER OF CYCLES
1"
1"

1262402