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CONFIDENTIAL

June 22, 1942

Dr. C. C. Furnas
 Technical Aide Section B-7
 National Defense Research Committee
 1703 32nd Street N.W.
 Washington, D. C.

Dear Dr. Furnas:

Thank you for your letter of June 16, and the copy of Gilliland's letter of June 10, 1942.

First of all the 110°C oven deterioration of which you speak was done in air during which, of course, there is a continuous absorption and desorption taking place. The total time spent at the high temperature corresponds to several thousand cycles since it takes several weeks to accomplish the deterioration. It is a permanent deterioration; we have found no treatment which will regenerate it. Furthermore, note the total loss of weight (4.77% - corresponding to CO₂ and H₂O) as well as the very great change in the elementary analysis.

We, also, have noted the temporary deterioration which you mention, but only with the Rumford material. The can of stuff which they sent us some weeks ago had a capacity on arrival, of 4.3% when tested in a small sample through several cycles. The deterioration of both rate and capacity of this stuff when run in our 32 tube exchanger (800 gms) is markedly faster than the pyridine-process stuff under identical conditions. Compare our report of Jan. 1942 with that of June 1942. See also Table VII in a letter of Gilliland to Furnas of May 19.

Gilliland's results are very interesting; you will find similar tests described in our reports and letters of Jan. and Feb. These were sealed tube tests in which it was shown that heating in vacuum for a week or two does not hurt the stuff; that dry O₂ alone, or water vapor alone deteriorates it more slowly than a

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combination of the two. The effect of added CO_2 or HCl was not studied. Gilliland is quite right in emphasizing the importance of the gas analysis. He will undoubtedly find relatively large quantities of CO_2 in the gas. The analysis also indicates that the volume of oxygen permanently absorbed must be greater than the volume of CO (the water would not show up as he indicated) evolved. You will recall that the analysis indicates approximately three atoms of oxygen are irreversibly held per molecule of chelate deteriorated, in addition to the oxygen which would disappear in the water formed.

In connection with the differences between the Rumford stuff and the pyridine stuff already noted we have to add the result of a preliminary x-ray picture by Pauling's laboratory. Although our own x-ray pictures were too crude to disclose any marked difference between these two preparations the much better pictures taken at Caltech do show a definite difference between them. I rather suspect that the Rumford stuff has water in it whereas the pyridine-process material we know has not. This may account for the differences in behavior that are emerging. If you would like to make comparisons on other tests we can ship Gilliland 100 gm. of pelleted material and up to 1 Kg. of unpelleted material.

The oil suspension apparatus is running. The first datum is as follows; delivery .4 cu. ft./hr 96.5% O_2 ; absorbing pressure 90 lbs./sq.in g.; absorbing temp. 20°C ; desorbing temperature 90°C .; a 9% (wt.) suspension moving through at 7.1 lbs./hr. This purity of O_2 is obtained without evacuating the expansion chamber and corresponds to the dissolved nitrogen. We have built and tested an effective defoaming expansion chamber which can be evacuated and as soon as we can get hold of an oil pump which will move the suspension from there into two hot O_2 -desorbing columns we should produce continuously 0 of better than 99% purity.

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Dr. C. C. Furnas

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With regard to the summer compensation the dates between which you can count my time as fully devoted to N.D.R.C. work are May 10, 1942 to August 10, 1942. I trust that something is being done about this with dispatch. If I can draw upon our present funds for this please supply me with something that can be presented to our comptroller.

Very truly yours,

Melvin Calvin

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Copy--E.P. Stevenson
" of last paragraph--S.S. Prentiss

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