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March 27, 1942

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Professor Harvey Diehl
Department of Chemistry
Iowa State College
Ames, Iowa

Dear Diehl:

I hope you will forgive the delay in answering your letter of last week, but I wanted to be able to send you some results on the compounds when I did write.

First of all here are the magnetic measurements on the last set of compounds:

	$\chi \times 10^6$
Red Inactive - Diehl -H-98	1910
Red Inactive - Calvin	1930
Propylenediamine - Diehl -inactive	2640
Propylenediamine-Calvin-active (4%)	not yet measured
3-Nitro (without O_2)-Diehl-H-95	2510
3-Nitro + 3.62% O_2 -Diehl-H-95	370

As you can see, the red stuff seems to be the same as ours. The x-ray pattern should be ready by Monday along with that of each of the other compounds. All the other values seem to be reasonable, except that I might have expected the active 3-nitro to be a bit higher. This may be due to not having completely removed the O_2 although it does not seem likely that much was left. We are also planning on getting the susceptibility of the 3-nitro + ?% H_2O . Do you have any suggestion as to the best method of getting a uniform hydrate and also how much water does it hold?

With respect to the more detailed theoretical interpretation of the magnetic measurements, I am having a look at Van Vleck's papers on the subject to see precisely what additional data we would need. I haven't yet found the references to which Spedding referred but from what I know about it already measurements at least at liquid air temperature and preferably at liquid H_2 temperature would be required. These will take some time to get. I will write you more about what I think of those possibilities after I have seen the Van Vleck papers.

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D. J. S. ADC 4/4/96

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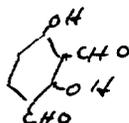
Professor Harvey Diehl

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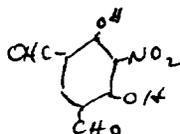
We now have a powder photograph of the Ni-free (V18a) stuff with the high magnetic susceptibility. It is definitely different from our active stuff and that prepared by Rumford which are the same. There is some sign that there might have been some oxide in the sample so the picture is being done again to make sure of the difference.

I am enclosing the graph of the comparison of the rate of O_2 absorption of the 3-nitro with some of our standard granules which we have used in all the other comparisons. The 3-nitro, as you can see, is quite different from any form of the parent compound all of which have the same general shape as the one shown. The difference between the 3-nitro pellets and the powder is not significant. You will note that in dry air at 1 atmosphere it has barely reach 3.0% after 10 hours, and that another 30 minutes in pure O_2 at 1 atmosphere, it went to only 3.2. It took an additional hour at 150 lbs. of pure O_2 to bring it to 3.7%. Is this in accord with your experience? The tremendous speed up to 2% should prove useful; i.e. make a larger number of faster cycles possible. The shape of the 3-nitro curve is really the normal one; it is the other one which is queer. I believe I have already told you that the magnetism in the 1% oxidation range shows no abnormality within the accuracy of our earlier measurements. We are now preparing a series of x-ray pictures in the same range in an attempt to discover what that induction period is due to.

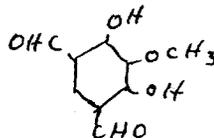
We have learned that the dialdehyde with which we have worked so far is



and have started work on the preparation of



and of



Unless these are very much faster than what we already have there isn't much hope in that direction.

The work on the solutions has not yet proved too hopeful. As you know the compounds are not very stable in solution and cannot withstand more than 3 - 5 cycles. The 5-nitro, however, is better than the parent compound. The 3-nitro curiously enough is extremely slow in solution. Figure that one out.

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Professor Harvey Diehl

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We have had some success with the Co compound of bis-trimethylene triamine. It can be made to take 8% O₂ under 300 lbs. of O₂, but it is easily irreversibly oxidized.

I am very anxious to hear about what success you have had with other substituted aldehydes.

Very truly yours,

Melvin Calvin

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