LABORATORY MEMORANDUM

No. 41-62

Subject: Self Contained Battery Plates

For: Dr. D.F. Herman

Date: March 7, 1962

PROGRESS REPORT

In October 1961 an attempt was made to prepare a self contained battery plate. A plate not made in the classical manner consisting of active material on a grid support, but a conductive plastic sheet containing active material. The sheet would have to be porous, and durable.

To initially test the premise that this type of plate could work, classic battery materials were used. Positive and negative plates were prepared using reagent grade lead dioxide for the positive and atomized lead in the negative. Mixtures of Nalcon, lead dioxide, sugar and graphite were used for the positive plate, while lead metal was substituted for the dioxide in the negative plate.

When immersed in electrolyte the cell had a potential of 2.0 volts across the plates. Because of the limited amount of active material available in the two disks the capacity of the cell was not very great. Subsequent charging and discharging showed that the cell operated in the standard manner.

Having seen that a cell could be constructed in this manner the next cell was prepared in a more practical way. This time commercial ingredients were used. The positive plate was made the lead monoxide (Grenox) and the negative plate with Grenox + 2% negative expander (202A). A cell was prepared using two pressed disks as before, and the cell was formed using a 6 volt battery charger. The cell formed in the usual manner and at the end of formation the voltage output of the cell was 1.8 volts.

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The following table shows the actual formulation used for this experiment.

A-5-22A Positive Mix		% by wgt.
PbO (Grenox)	5.5 gms.	55.0
Nalcon	2.0 gms.	20.0
Graphite	1.0 gms.	10.0
Sugar (Ground)	1.5 gms.	15.0
Total	10.0 gms.	100.0

A-5-22B Negative Mix		
PbO (Grenox)	5.88 gms.	56.0
Negative Expander(232A)	0.12 gms.	1.1
Nalcon	2.0 gms.	19.1
Graphite	1.0 gms.	9.5
Sugar (Ground)	1.5 gms.	14.3
Total	10.5 gms.	100.0

Disks 1 1/4" in diameter and weighing 2 gms. were pressed at 120°C using 10 tons of pressure for 3 minutes.

The sugar is leached out in the formation acid creating a porous internal structure in the disk. The graphite makes the disk conductive, while Nalcon forms the supporting matrix for the active material.

Cycling of the cell was somewhat disappointing. The cell did not return to the preceeding voltage output. Each time it was cycled it showed lower and lower output voltages. It is felt that this may have been due to the lack of proper charging equipment. However this could also be due to improper formulation.

There are many advantages to having a plate made in the described manner. 1) Plates can be made much thinner than any cast grid plate. Since in automotive applications (high drain situations) the reaction in a battery is almost a surface reaction, this is a considerable advantage. 2) Plates can be prepared in sheet form and cut to any size or shape. 3) Antimony is eliminated from the battery, along with its deleterious effects, and 4) The plates are considerably more durable, being plastic rather than a brittle grid structure.

With the limited time and facilities to devote to this project it was impossible for us to fully exploit this development. However certain suggestions concerning future work became evident; as follows

a) Explore the effects of various loadings.
b) Explore the possibility of producing these plates on a paper making machine.
c) Determine if a laminate of sheet and separator could be produced. Thus each plate would be a completely self contained unit.

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It is felt that the described product could be very useful, and productive for the company. The surface has just been scratched concerning its development and application. It is the purpose of this report to call attention to the idea and describe the progress to date.

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