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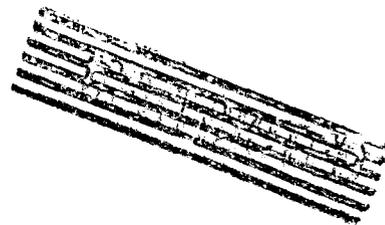
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Contract No. W-7405-eng-48

SUMMARY OF THE RESEARCH PROGRESS MEETING

September 23, 1948

Margaret Foss Folden

Special Review of Declassified Reports

Authorized by USDOE JK Bratton

Unclassified TWX P182206Z May 79

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Physics-General

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SUMMARY OF THE RESEARCH PROGRESS MEETING

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Synchrotron Magnet Testing. E. McMillan

Further investigation of the azimuthal uniformity of the magnetic field in the synchrotron has resulted in the realization that most of the inhomogeneities in magnetic field result from a residual permanent magnetism in the iron which tends to equalize at all points in the orbit in a time interval corresponding to the pulse rate, but which exhibits large variation for a time interval corresponding to a quarter cycle of the resonant frequency of the magnet. This is believed to be caused by the necessity for flux lines crossing the plane of laminations and causing eddy currents which tends to delay the equilization. This conclusion points to the desirability of using the first quarter cycle of each magnet current pulse for acceleration (instead of the third), thereby allowing adequate time for the residual field to become uniform and greatly simplifying the task of compensating the azimuthal variations. Measurements of the field uniformity were made on this principle, and it was found that except for a second harmonic variation which is expected because of the asymmetry of the magnet, the field is quite uniform. The only difficulty which appeared to exist with this type of operation was the presence of a starting transient which made the measurement of magnetic field difficult and might possibly have interfered with injection into a betatron orbit.

This difficulty has been largely overcome by providing a separate bias winding around the magnet through which direct current is passed to provide a 30 gauss d.c. bias. This permits the starting transient to decay before injection time is reached and permits careful measurement of the field. It was observed that even with this small bias, some non-uniform residual field was present, however, and it was necessary to make use of a

few of the radial compensating wires in order to obtain reasonable azimuthal uniformity.

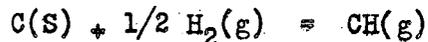
At present, the total variation in magnetic field is about .4 gauss at the time of injection, with a peak field of 5000 gauss. It was observed that the presence of the d.c. bias moved the time during which the betatron flux condition is fulfilled away from the time of injection, and it was, therefore, necessary to backwind the flux bars, placing this winding in series with the magnet bias coil in order to establish the betatron flux condition at the proper time.

Plans are being made to investigate the betatron flux condition.

Progress In Astro-Chemical Research. L. Brewer.

Investigations in high temperature thermodynamics are being carried on in order to duplicate conditions existing in the reversing layer of stars and during the earth's formation from the sun. This research is carried on at temperatures as high as 3500° K and the thermodynamic and chemical properties are measured.

Concentrations of observable and non-observable species are of interest. As an example the C₂ spectra has been studied. The equilibrium constants, heat of dissociation and heat of formation of C₂ = 2C have been calculated and studies have been made on



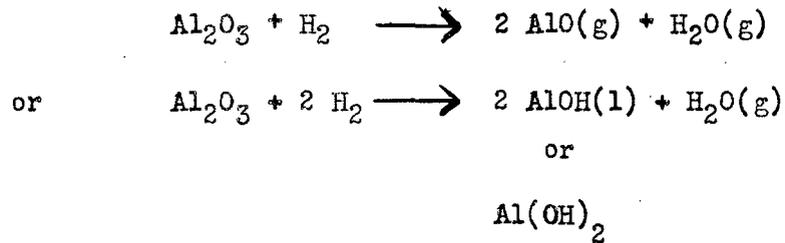
Similar investigations are being carried out on CN.

Tantalum carbide crucibles are now being used for this research, and it has been found that TaC is usable to temperatures as high as 4000° K.

Another problem being examined is the state in which light elements like Li, Be, and H were retained if the earth was formed from the sun. Hypotheses advanced include a process of capture, a stable H species or gaseous hydroxides and hydrides.

High temperature experiments are also being conducted on Al and its oxides to find out what gaseous species exist at these temperatures. Actual species which exist are Al₂O₃, AlO and Al₂O₂. Following investigations of the aluminum in oxygen systems, H₂

will be passed over the mixture and reactions of the type listed below are expected.



N¹². L. Alvarez.

The possibility of a new radioactive species was discussed. Using a carbon target, counters with absorbers, and a 32 Mev beam, pulses were observed on the oscillators which were first thought to be B¹², N¹⁷, C¹³, and finally N¹².

Measurements of the half life gave .01 seconds or slightly under the C¹²(p,n)N¹² reaction. The threshold is 20.3 Mev and the highest energy measured was 16.9 Mev.

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