

P.D-79  
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5000KW. HETERO. P<sub>9</sub> PLANT DISCUSSIONS ; LATTICE GROUP

A Group, composed of the following workers: Dr. Courant, Mr. Ginns, Dr. Laurence, Dr. Pontecorvo, Dr. Sargent, Dr. Volkoff, was formed in order to decide the essential lattice characteristics and dimensions of the producing part of the P<sub>9</sub> heterogeneous water-cooled 5000kw. plant. Messrs. Auger, Halban, Newell and Placzek were present at the first meeting, at which the following points were discussed from a rather general point of view.

1. Rod size.
2. Lattice spacing.
3. Diameter of unit.
4. Height of unit.
5. Reflector.

The above points were discussed with the following considerations in view:

- a) Cooling H<sub>2</sub>O.
- b) Aluminium around rods.
- c) Aluminium tubes for the flow of the cooling water.
- d) Temperature of rods.
- e) Temperature of P<sub>9</sub> (temperature of reflector will be considered by the shielding group).
- f) Decomposition of P<sub>9</sub> by radiation (the decomposition in the shield will be studied by the shielding group).

It was decided to fix the attention on the only lattice on which an exponential experiment had already been performed. Rod size : 1.1" in diameter. Square lattice, 5-3/8" distance between centres of rods. In such lattice the experimental result gives for the Laplacian

$$\nabla^2 = \frac{\pi^2}{(\text{critical radius of the bare sphere})^2} = \frac{k - 1}{(\text{migration length})^2} \sim 880 \times 10^{-6}.$$

Actually these data refer to the lattice not cooled : the presence of the cooling water and of the two Al thicknesses changes the value of the Laplacian in a way very difficult to estimate. \* It was suggested by Dr. Placzek

\* The thickness of the Al tube around the metal will be ~1mm, the thickness of the water film ~3mm., the thickness of the outer Al tube ~1mm.

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that knowledge of the experimental data on the change of  $k$  (or better on the change of the Laplacian) produced by the cooling water and Al tubes (graphite units), would enable us to predict accurately the  $P_g$  analogous problems. Consequently, it was decided to raise the question of getting such data from Chicago. In the meantime, the question concerning the height and the diameter of the tank could be answered by estimating them for various postulated values of the Laplacian of the actual water-cooled system. Dr. Volkoff and Dr. Courant will report on this point within two days.

It was observed that the minimum of the critical volume is the more important point in the design of the plant under consideration: in fact the present plant is not a power plant, and since the method of water-cooling the rods has been decided upon, the 5000 kw. value is well below the maximum value of the power which may be dissipated with that method.

Mr. Ginns will report on the temperature of the rods; Dr. Sargent and Dr. Pontecorvo on the power "created" in  $P_g$ . Concerning the decomposition of  $P_g$  by radiation, it was noticed that experiments show that the amount of decomposition is proportional to the number of ions produced for  $\alpha$  and  $\gamma$  rays. It has been suggested also that the problem of decomposition be studied with the new X-ray unit.

The next meeting will be held on Friday morning, April 21st, 1944.

B. Pontecorvo

Montreal, Que.  
19th April, 1944.

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