FINAL REPORT No. 395
ITEM Nos 22, 31

GERMAN FLUORESCENT LAMP INDUSTRY
AND
PHOSPHOR CHEMICAL MANUFACTURE

BRITISH INTELLIGENCE OBJECTIVES
SUB-COMMITTEE

LONDON - H.M. STATIONERY OFFICE.

GERMAN FLUORESCENT LAMP INDUSTRY AND PHOSPHOR CHEMICAL MANUFACTURE.

Reported by:-

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BIOS Target Numbers: C31/2349,C22/2089, C22/3043, C31/675, 22/3, C22/3044, C22/3045, C31/2350, C22/3046, 22/63a, C31/382, C22/937, C31/347a, C22/3046a, C31/2351, 22/65, C31/578, C22/3047, C22/3048, C31/832, C22/3028, C22/1936, C22/1415.

B.I.O.S. Trip 1531

BRITISH INTELLIGENCE OBJECTIVES SUB-COMMITTEE
32, Bryanstone Sq.,London W.1.

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REPORT 1 - THE KAISER WILHELM INSTITUTE, HEIDELBERG

14.11.1945.

Object of visit:

To determine whether any work on the development of inorganic phosphors or fluorescent lamps had been carried out at the above institute.

Summary:

No evidence could be found that the Institute had ever carried out work on fluorescent chemicals but a certain amount of interesting data on other fields of research were obtained.

Personnel Interviewed:

Dr. Leonhard Birkofor
Dr. Maier Leibnitz.

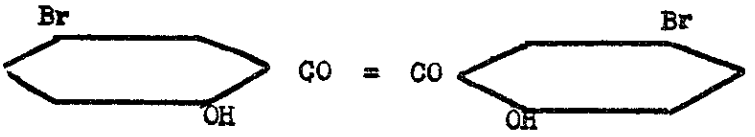
Dr. Maier Leibnitz was the Deputy Director under Prof. Dr. Bothe and was described as Director of the Institute for Physics.

Dr. Leonhard Birkofor was assistant to Prof. Richard Kuhn described as Director of the Institute for Chemistry and Administrative Head of the Kaiser Wilhelm Institute.

Information Obtained During Interviews:

(1) Dr. Maier Leibnitz stated dogmatically that no work on the development or properties of inorganic phosphors had been carried out in the Kaiser Wilhelm Institute. He further stated that the only use of fluorescent screens known to him at the Institute was for the detection of radiation from the cyclotron in the Nuclear Physics Laboratory. He suggested that we might care to question Dr. Kuhn and possibly Dr. Hausser although he held out no hope of our obtaining information relative to the subject of inorganic phosphors. He suggested as possible sources of information Dr. Schons and Dr. Riehl of Berlin University but did not know the whereabouts of these individuals. He volunteered the information that Dr. Riehl has worked in the Osram organization Berlin but had been for some months previously in Heidelberg. His present whereabouts were not known to Dr. Leibnitz.

(2) Dr. Leonhard Birkofor was interviewed during the period the investigating team was awaiting Dr. Leibnitz. He volunteered the information that the work of Dr. Kuhn and himself was directed largely to biological and biochemicalresearch. He stated that they had developed a substituted benzil compound of the following constitution :-



i.e., symmetrical 1.1 dihydroxy 4.4 dibrom benzil., which he stated had bacteriocidal properties similar to those of penicillin. The compound MP 213°C consisted of yellow needles and a 5 gm. sample was obtained.

Dr. Birkofor stated that so far 500 gms. had been distributed and tests in various hospitals had shown positive reactions against streptococcus, staphylococcus, gonococcus and pneumonococcus. The medical investigations at these hospitals were continuing.

REPORT 2 - DISCUSSION WITH DR. ABRAHAMOZIK, FORMERLY RESEARCH CHEMIST OF THE WELT-POST INSTITUTE, HEIDELBERG.
14.11.1945.

Introduction:

Dr. Abrahamozik was introduced to Mr. Anderson and Dr. Aldington through the agency of Dr. Kuhn of the Kaiser Wilhelm Institute. He was visited at his private house Ander Tiefburg 2, Heidelberg, and for this reason two only of the investigating team were employed.

Dr. Abrahamozik stated that he had worked latterly at the Wesselhausen castle near Tauberbisohofsheim Wurtzberg for the German Government.

Summary of Discussions with Dr. Abrahamozik:

With Dr. Lappe, a physicist, he had been engaged on the preparation of metallic sulphides, selenides and tellurides by new methods employing furnacing at ultrahigh-pressures circa 1,000 atmospheres. The object was to obtain improved efficiency of transformation of long wave U.V. into visible radiation and secondly to produce fluorescent powders responsive to infra-red radiation of long wavelength corresponding with 400°C radiators.

Ultra-Violet Phosphors:

A large range of possible substances had been investigated of which the most effective was found to be zinc sulphide containing 5% zinc selenide activated with 0.0001% Cu, up to 1% Cu. This material was stated to be some 30% to 50% more efficient than a simple zinc sulphide produced by the same method.

Outline of Method of Preparation:

The various salts used for the preparation of sulphide phosphors were purified very carefully by shaking methods employing organic reagents in organic solvents - the principle being described as Isothermdiffusion. For example, reagents such as Diphenyl dicarbazone in carbon tetrachloride was used for copper. A description of the process entitled "Zur Herstellung Hochstgereinigtier Reagentienfür Mikro Chemische Zwecke Durch Isothermdiffusion" by Dr. E. Abrahamozik was published in Die Chemie 55.233 1942 and also a paper by the same author - "Zur Bestimmung Geringer Menger Von Schwermettall in Wassern", published in Mikrochemie BD XXV/1-4.

Dr. Abrahamozik has in course of preparation a paper describing the use of electrodialysis for purification of certain salts from heavy metals and details of this were also obtained see appendix 3.

From the purified raw materials zinc sulphides and selenides were produced by the usual methods and then subjected to heat treatment in an atmosphere of either nitrogen or hydrogen at pressures of the order of 1,000 atmospheres.

The bomb used for this work consisted of a steel tube (cr. mo. steel) closed at its lower end and having a screwed stopper at the upper end. The tube dimensions were (see drawing attached).

Bore..... 8-10 cms.
Wall thickness..... 5-8 cms.
Length..... 25 cms.

A gas inlet and a thermocouple element were fitted through the stopper.

The heating element consisted of a molybdenum coil inside the bottom of the bomb designed for 36 volts, 500 amperes. Leads to this coil were insulated with porcelain.

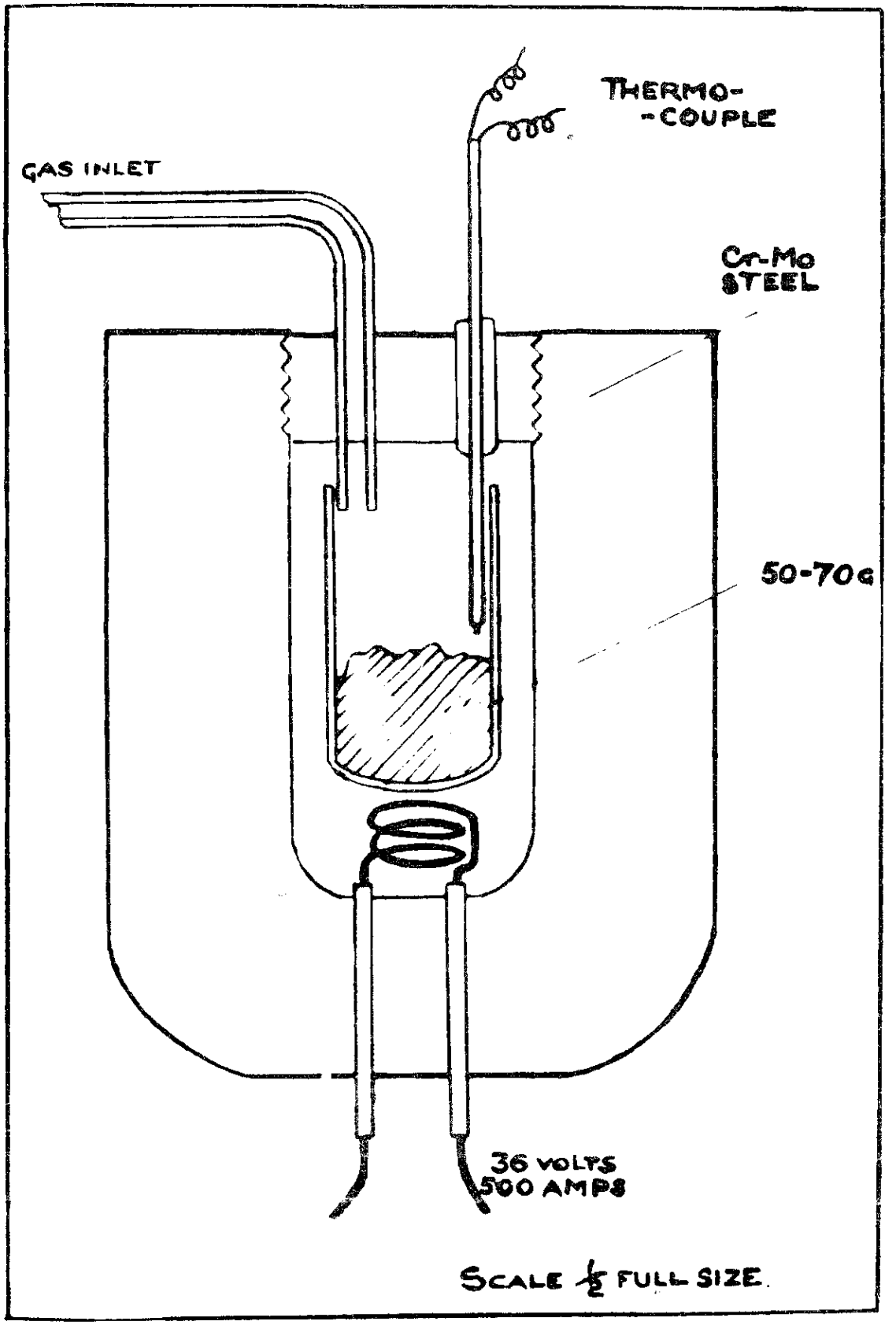
The reagents for fusing were contained in a quartz tube 10-12 cms. long and 4 cms. diameter resting on but not in the coil.

Each fusing load consisted of between 50 and 70 gms. of the appropriate sulphides and it was stated that convection currents gave a very even temperature over the whole crucible.

Dr. Abrahamozik considered that the high pressure method of fusing was probably not superior to more normal methods for sulphides to be used for cathode ray screens and the like.

Information provided by Dr. Abrahamozik entitled "Method of purification of Ion Exchanges" is attached (Appendix Report 2 No. 2).

For the second purpose, however, he considered that improved sensitivity to I.R. activation was probably obtained by the high pressure method of preparation.



DIAGRAMATIC REPRESENTATION.

I.R. Phosphors:

To produce powders responsive to long wavelength I.R. radiation - zinc, lead, mercury, cadmium sulphides, selenides and tellurides had been investigated. The zinc sulphide + 5% selenide was good and the telluride compound was probably better but less was known about the properties.

These latter compounds were used in receiving circuits for detecting I.R. by employing the phosphor as the dielectric of a condenser fitted in a sensitive valve receiver. Reception of I.R. radiation was indicated by circuit changes resulting from changes in the dielectric constant of the phosphor.

REPORT 2
APPENDIX 1.

Dr. E. Abrahamozik.

The Preparation of highest purity substance by Electrodialysis.

The Principle of the Method.

Electrodialysis has been used for a long time, for the separation of ions from the unionised colloidal solutions or from solid bodies. In this method the dialising procedure through membranes, as for example parchment paper or cellophane, is assisted and accelerated by an electric field. This acceleration of the dialysis, acts naturally only on the ionised dialysable materials and not upon the electrically uncharged dialysable material. Ions, which are firmly absorbed on the colloid and which cannot be separated by washing, are removed by electrodialysis and thus separated from the colloid. In the colloid then, there exists in place of the metal ions, only Hydrogen ions and in place of the acidic ions, only Hydroxyl ions. The ions released by dialysis i.e. the electrolysis, are removed by continual or frequent washing of the electrode cells, so that by diffusion, the purification effect is not made partly reversable. So long as the conductivity of the substance at the beginning is high, it is electrolised at low voltage and this voltage is constantly raised during the course of purification procedure. Electrodialysis has found broad use in two especial spheres: in colloid chemistry for the removal of salts from colloidal solutions and in soil research and especially plant nourishment materials, for the separation of ionised substances from the non-ionisable basic substance of the soil.

In preparative inorganic Chemistry, electrodialysis was hardly used at all because the necessary high current requirements are prohibitive, except in the case of preparations of high value; this serves for the introduction of electrodialysis into the technique.

Because electrodialisers could not be bought in recent years and besides, most models still had imperfections (e.g. bad joints of the cells), we prepared the necessary electrodialisers ourselves (glass blowing). Two forms of electrodialisers were used: in one form the three chambers arranged side by side, in the other the cell spaces arranged concentrically inside each other.

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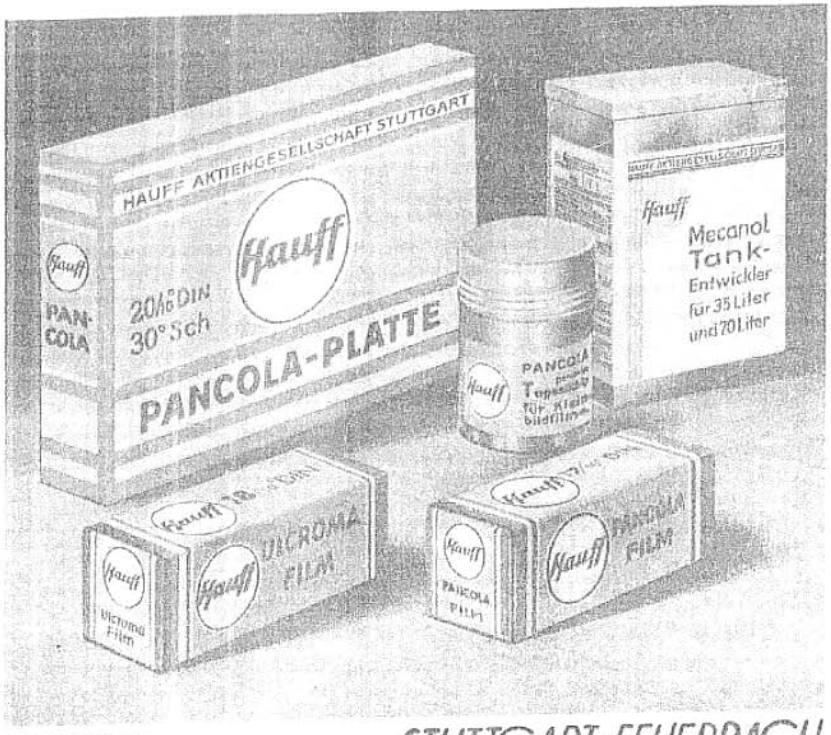

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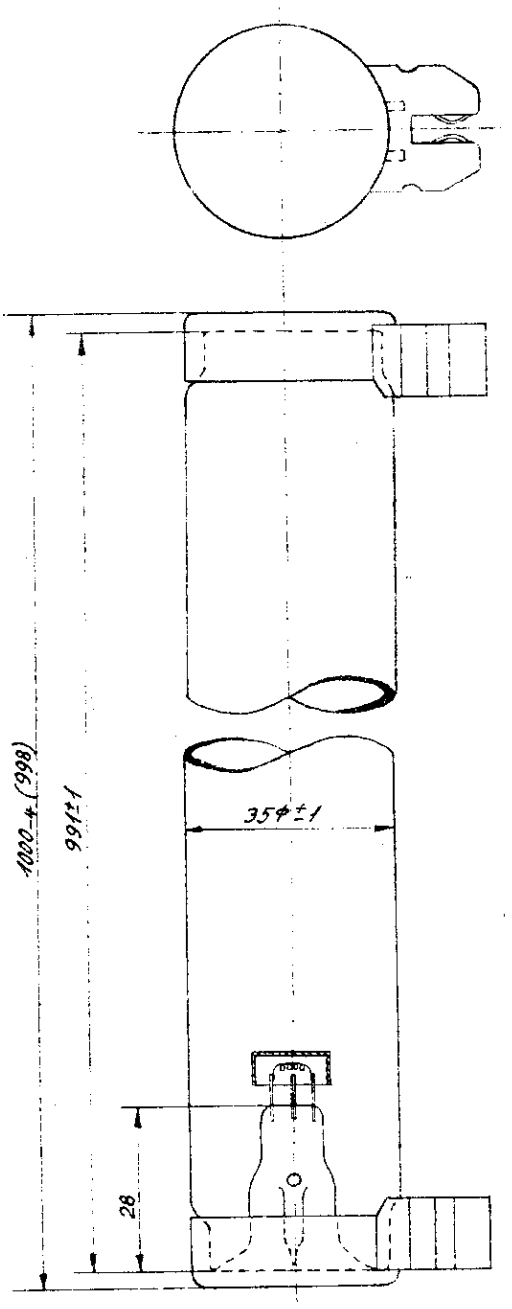

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	A 3			Datum	Name	OSRAM G.m.b.H. Kommanditges.			Nr. KS 6	
	A 4	Angefertigt:		29.8.43		Werk S		Berlin		
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	A 3									
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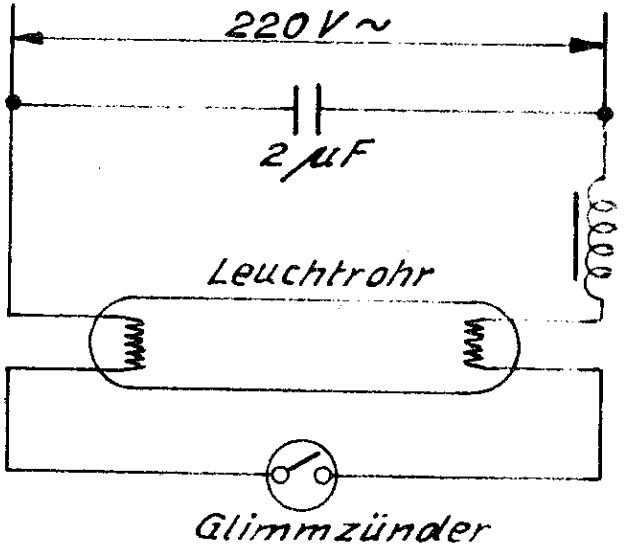

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Stück	Benennung	Teil	Werkstoff	Rohmaße	Lager und Modellnummer	DIN Nr.	Bemerkung	Bl. Nr.

Nr.	Änderungen	Datum und Name	Nr.	Änderungen	Datum und Name

	Datum	Name
Angefertigt:	29.8.	
Geprüft:	1945	Ns.

OSRAM G. m. b. H. Kommanditges.
Werk S Berlin

Nr. KS7

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Maßstab —

Schaltplan für HN.

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