

DECLASSIFIED
CENTRAL INTELLIGENCE GROUP
NEW WAR DEPARTMENT BLDG.
Washington, D. C.

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General descriptions on the Continental Institute of Science.

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Auth: DAVIS, 77/1785

Date: 3/2/78 By: [Signature]

The Continental Institute of Science

- Main Institute -

Managing Bureau
23 laboratories
i.e.

- Director's Laboratory
- Chemical Laboratory for Agricultural Products, Chemical Lab. for forest Products, Chem. Lab. for animal Prod. Biochemical Lab. Lab. of Fermentation. Lab. of Soil Science, Lab. of Fibres. Lab. of Inorganic Chem., Lab. of Electro-chemistry, Lab. for Fuels, Lab. for Combustion, Lab. of Metallurgy, Lab. of Machinery, Lab. of Power, Lab. for Aeroplane and Aeronautics, Lab. of Electricity, First Lab. of Civil Engineering, Second Lab. of Civil Engineering, Lab. of Architecture, Lab. of Air Protection.

- Examination and Testing Department.
Analytical Room, Lumber Testing, High Temperature Room, Low Temp. Room.

- Factories
Machine shop, Oil Factory, Glass Shop, Plywood Factory, Pulp Factory (under construction).

- Field of Animal husbandry
Museum and Department of Biology.

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- The Institute of Horse Disease
- The Institute of Veterinary
- The Geological Institute
- The Hygiene Institute

The Explanation of the Researches of the Continental Institute of Science

(A) Laboratories

(1) The Directors laboratory

(1) Cultivation of topinambou

Topinambou has not been cultivated in Manchuria. This research was undertaken since the year 1936 in alcohol fermentation. In south Manchuria the most profitable root is thought to be sweet potato, and in north Manchuria to be topinambou. However, topinambou requires much labour especially for harvesting and it can't be regarded as a profitable root crop. As the source of fructose it is suitable as a crop. As to the Raffination, according to our research, it is not simple and requires high technique.

(2) Cultivation of Ergot

Ergot is used as a styptic. Ergot has not been produced in Manchuria. Ergot is one sorte of the plant disease. For six years ago, wild ergot has not been found in the field of the Institute. We isolated the microorganism and succeeded to form ergot out of the rye by the artificial injection of the pure cultured ergot microbe. The physiological experiment of the cultured ergot was carried out and proved that the physiological effect is not inferior to the imported medicine. Under the favorable condition, we are able to obtain about 2 kgs of ergot out of one hecter of rye field.

(3) Researches on storage of corn.

The storage of corn is an important problem in Manchuria. The climatic conditions here are rather favorable, compared with the other countries. However, the practical method, without large expenses is the key point of storage in this district. This research is chiefly limited to the fundamental problem, and we have not been able to find a better method other than the domestic method of the Manchurian farmer.

(2) Chemical Laboratory for agricultural products.

(1) Researches on soya bean.

Soya bean has been regarded as the source of plant oil. We tried to utilize as the protein source of national nourishment. We undertook to utilize the aminoacids of the soye bean protein obtained as the byproducts of Ajinomoto industry. Concentration of methionin was investigated. Utilization of leucin was also investigated.

(2) Researche on the preparation of furfural.

Furfural is prepared by the acid treatment of pentose of plant. We tried to prepare furfural from the agricultural byproducts, such as corn-cob and cotton-hull. The laboratory experiment as to the preparation has been already accomplished and the factory is under construction. Furfural is used as organic solvent, as well as flota-tion oil, in the form of xantate. Fumalic acid and maleic acid are also prepared from it. The yield of furfural under industrial scale is expected to be 8 to 10% of the raw material.

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- (3) Researches on the plant protection and plant hormones.
Main problem was the preparation of nicotine by adsorption from tobacco leaves of domestic kind and that of the pharmaceutical tobacco aspects.
- (3) Chemical Laboratory for Forest Products.
- (1) Research on the utilisation of forest products.
The tannine content of Manchurian weed bark were examined.
- (2) Cellulose, Lignin and high molecular compounds.
The Manchurian woods were examined from the stand point of pulp and paper industry. Thus the production of rayon pulp was undertaken. Further the preparation of craft pulp from the Manchuria wood was investigated and succeeded in the Manchurian Soya bean stalk Pulp Company (Kai-Yuan). The utilization of lignin was investigated in view point of sulphite pulp industry.
- High molecular compounds were investigated, especially phenol and furfural resins to apply them as the adhesive of water proof plywood for aeroplanes.
- (3) Fibrous plastics and wood.
Fibrous plastics and strengthened wood were investigated.
- (4) Chemical laboratory for animal products.
- (1) Fodders and forage plants.
Examination of the nutritive values of wild grasses as well as leaves of woods as the substitutes of ordinary fodders. Thus we found that several wild grasses have high nutritive value, quite comparative to cultivated grasses. The application of wood leaves as fodder is worth mentioning.
- (2) Utilization of cattle products.
The first problem was the investigation of hair of swine. The second problem was the research on wool of native sheep. The third problem was the splendid achievement of the high class of the photographic gelatine from the calve kids.
- (5) Biochemical Laboratory.
- (1) Researches on nourishing substances.
The native nourishing substances were examined, especially chopped and fermented vegetables and Manchurian sauce.
- (2) Researches on the nourishment especially Vitamins problem.
In Manchuria, vitamins problems are very important. Determination of vitamins content of vitamins A, B₁, B₂, and C of the Manchurian feeds were determined. Serious problem of folk life is the supply of vitamins C in winter season. Rational storage of vegetables, soybean malt and onion are the practical method. Concerning vitamins B₂ problem will be given later on.
- (6) Laboratory of Fermentation.
- (1) Fermentation chemistry.
Fermentation chemistry is very important in Manchuria. Hawthorn wine is invented in our Institute and prepared in one of brewer in Chang-chun. Other fruit wines are also investigated.

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Kaolian-chu (Manchurian millet) is the most popular beverage of distilled wine. The preparation of lactic acid from the Kaoliang-chu-lee has been investigated.

(2) Researches on useful microorganism.

Fermentation chemistry is not limited nowadays, to the brewery. Vitamins by forming microorganism was found and determined to belong to Erenthecium. This method is now investigated in industrial scale in Manchurian Product Industrial Company in Mukden.

(7) Laboratory of soil science.

(1) Chemical, physical and microbiological researches on soil.

In Manchuria, so called alkali-soil (one kind of saline soil) is distributed in Middle and southwest districts. Alkali-soil is alkaline due to the presence of sodium carbonate. Sodium sulphate and other salt are also present in it. Alkali-soil is not productive. In order to utilize this soil, our researches have been undertaken. The causes of infertility was proved to be not only due to alkalinity of soil, but the presence of sulphate. This is very important point.

The fixation of nitrogen from air by microbe is another important problem of agriculture. We cultivated root nodule bacteria of soybean root and are applying this cultivated bacteria to the cultivation of soybean.

(2) Chemical manures and self supplying manures.

Chemical manures were not used in Manchuria for twenty years ago. However, it was found by the examination and statistical investigation, the fertility of soil is decreasing year by year, especially in South part.

Thus the problem of manures became important problem in agriculture. The chemical manure, ordinary used, is ammonium sulphate. In our Institute the manuring value of calcium cyanamid, as well as, its practical way of manuring were investigated. The application of calcium cyanamid as the disinfect is very good idea.

The self supplying manures are very important problem in the native agriculture. Scientific researches were also carried out, but their results are not worth mentioning.

(8) Laboratory of organic Chemistry.

(1) Researches on the organic chemical industries.

Chief problem has been on the fat and oil industries. In the South and West districts of Manchuria, so-called Mongolian apricot is abundant. In this laboratory the utilization of apricot kernel was established as the following:

Apricot kernel (stone fruit)

Apricot kernel oil

(very good substitute to olive oil)

Kernel oil cake

↓
Amygdalin (glucoside of benzaldehyde) (used as the medicament of horse disease)

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- (2) Researches on medicines especially on Chinese medicine.
The utilisations of wortleberry and artemicoid were investigated. The results were not conspicuous. Cultivation of Artemicia is one of the important problem in Manchuria.
- (9) Laboratory of Fibre.
- (1) Researches on tussor silk.
Tussor silk is obtained from the cocoons of wild tussor worm. In this laboratory new method was invented to elevate the strength of silk by 1 gram per denier. This invention was used in practical factory.
- (2) Researches on the plant fibres.
In order to prepare the fibres from bast fibres, this investigation was undertaken. Especially separation and refining of fibres by the electrolytic method is investigated and proved to be effective, however, this process was not examined in industrial scale.
- Refining by fermentation process was also investigated and in practical work applied.
- (3) Researches on the plant fibre sources.
Chief problem was concentrated to the cultivation of so-called Mongolian mulberry, cultivated chiefly in North China. The aim of this research was to cultivate it, as wind protecting plant as well as fibre source. It was found that we may be able to cultivate in Middle Manchuria. The cultivation was carried out in the agricultural Experimental Station of Sau-pin province.
- (10) Laboratory of Inorganic Chemistry.
- (1) The production of plug for motor-car.
The preparation of special porcelain from tale occurred from South Manchuria was studied. Using a small quantity of flux, the powdered and pressed tale was fired about 1400c.
- The porcelain thus prepared has good nature, for heating and electrical insulation, and is suitable for plug of motor-car. Now it is undertaken to produce it in industrial scale.
- (2) Studies on rare element minerals from Manchuria.
Since 1940, we have studied rare minerals occurred from various localities in the granite region of Hai-Cheng prefecture, South Manchuria. There were found new occurrences of euxenite, fergusonite, betafite, columbite, allanite and zircon, which were identified chemically or mineralogically.
- Their state of occurrence show that euxenite and fergusonite only can be mined for extraction of uranium and rare earths. The technical treatment of the extraction of these elements from the ore has not yet been commenced by us.
- (3) On the resource of potassium.
In this country, no potassium deposit has been found so we have to obtain by the extraction of potassium from potassium feldspar, which is occurred in South Manchuria abundantly. Heating the finely

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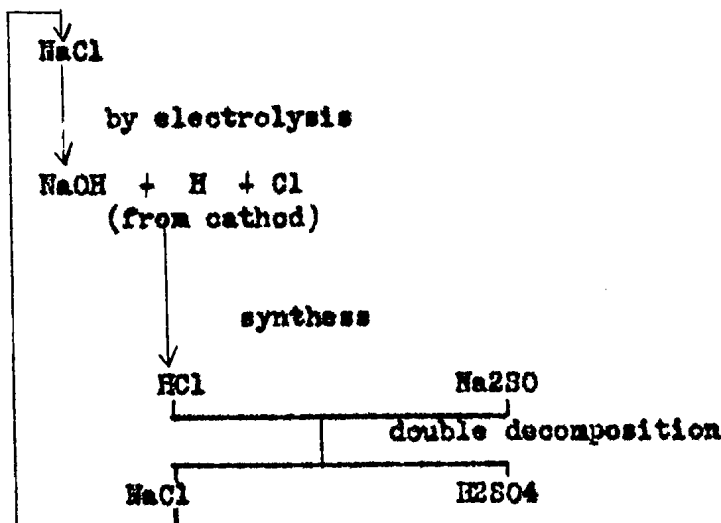
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powdered ore with a mixture of calcium oxide and calcium chloride over 900° , the potassium compounds are sublimated in the wall of cooling chamber. From this raw material thus obtained potassium compounds are extracted chemically as a purified form. The other various methods of heat treatment of the ore mixture have been examined. From the technical point of view, it is, however, concluded that the latter method is too difficult to realize in practice.

(11) Laboratory of Electrochemistry.

(1) Chemical application of electricity.

The chief problem is the so-called indirect electrolysis of sodium sulphate as the following diagram.



This method is to be examined under industrial scale in Manchuria Soda Company in Kai-yuan.

(2) Researches on galvanic elements.

In Manchuria, one of the important problems is to find suitable elements in cold season. As to the primary elements suitable elements were constructed by the application of a CaCl_2 . As to the batteries the problem was not solved except improvement of thermal insulation and artificial heating.

(12) Laboratory of fuel.

(1) Properties and application of coal and anthracite.

The properties of Manchurian coals has been examined.

(2) Researches on treatment of butylalcohol in order to improve the octane value was investigated.

The utilization of birch oil for anti-frozen lubricating oil and liquid fuel was investigated. Hydrogenation process has been applied and tested under semi-industrial scale.

(13) Laboratory for Combustion.

(1) Researches on the combustion apparatus and oven.

Suitable oven for home life was investigated.

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- (2) Researches on the combustion method.
Researches has been carried out chiefly on the methods of burning of boilers. This is one of the most important problem for economizing coal.
- (3) Researches on the heat economy of factories and house keeping.
The economic control is the significant problem. It is not only the improvement of combustion, but the insulation and economic use of heat energy are included.
- (14) Laboratory of Metallurgy.
- (1) Ferrous as well as nonferrous metallurgy.
The chief problem is the refining of molybden from poor molybdenore of Manchuria. A new method has been invented in this laboratory by the application of sodium sulphate. Semi-industrial examination was not realized.
- (2) Scientific researches on the brittleness of steel and iron.
This research was undertaken to determine the correlation between the composition as well as heat treatment to the physical properties of steel.

By applying oscillograph, very interesting result was obtained.
- (15) Laboratory of Machinery and (16) Laboratory of Power.
- (1) Researches on machines, especially internal combustion.
Engines which can be applied to a motor car or tractor with gas generator using bituminous coal were carried out. Several motor cars were brought into practice.
- (2) The study of fluid problems, especially the theoretical study on cyclone has been done, special cyclone designed by Professor Ikemori was used in army's gas (gs) power mill.
- (3) The testing of materials used for machines, especially for farming tools were carried out.
- (17) Laboratory for aeroplane and aeronautics.
- (1) Researches on ice formation on aeroplane.
The conditions of ice on aeroplane were scientifically examined. The strength of adhesion of ice to aeroplane body and propeller was determined under various conditions. The most dangerous temperature for ice formations is determined to be -7 to -15°C under these experimental conditions. Suitable protecting method against ice was not found except applying ethylene glycol.
- (2) Experiment on the fatigue test of lumber for aeroplane.
Although the fatigue test of metals has been studied in many occasion, that of lumber has not been determined. Very interesting result was obtained concerning the fatigue of lumber.
- (18) Laboratory of Electricities.
This laboratory was established recently and the equipments are not enough. The theme are as the following:
- (1) Electrical communications.
 - (2) Electric machine.
 - (3) Electrical transportation.

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However, the main research is the electrical determination of water content of plywood. However, the suitable method is not yet found.

Another problem is the small electric generator driven by wind mill were investigated and to a certain degree succeeded. However, from the standpoint of practice, this method should be improved in the future.

- (19) The first Laboratory of Civil Engineering.
- (1) Such cements used as substitution for ordinary portland cement are researched, especially natural cements and cement-mixtures are tested.
 - (2) The properties of soil cement and its application for the pavement of a road or an aerodrome are investigated. Especially relations between the size of soil grains and the mechanical properties of soil and the mechanical properties of soil cement are tested.
 - (3) Bituminous substance and its application for a road are researched, especially on the standpoint to save the materials.
- (20) The second Laboratory of Civil Engineering.
- (1) Methods of the treatment of sewage are researched, especially the testing used on Inhoff's tank, and the method of irrigation were carried out. In Manchuria the severe winter causes many obstacles to the treatment of sewage.
 - (2) Methods of the improvement of drink water are researched, especially the purification method on a small scale which can be applied for citizen has been researched and the testing on precipitating substances was carried out.
 - (3) The relation between Kassin Beck disease and drinking water has been researched and found there is no relation between them.
- (21) Laboratory of Architecture.
- (1) Building materials such as bricks, mortar, concrete, roofing material, etc. are tested. Under the war conditions these investigations were very important for saving materials.
 - (2) Building constructions, such as brick construction, reinforced concrete construction are investigated. Especially brick construction with reinforced concrete construction shows practical significance. Experimental house has been constructed in our Institute, in which steel has been saved up to about 70%.
 - (3) Architectural, sanitary problems, such as room temperature, humidity, ventilation problems were investigated. The theoretical as well as practical investigation to find the relation between the room temperature and the outdoor temperature are analytically researched.

The area of window for the winter life should not be too large in the North Manchuria, say, north of Chang-chun.

- (22) Laboratory of Air Protection.
- (1) Physical and chemical air protection.
The method of smoke generation and others were examined.

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- (2) Testing of gas mask for citizen use in the whole of Manchuria was carried out.
- (23) Laboratory of applied physics.
This laboratory was established recently. The remarkable result is the invention of so-called pressure element, which allows local pressure by electrical way.

(B) The Examination and Testing Department.

- (1) Analytical Room.
Analyses are carried out by the request of official, manufactures and citizen.
- (2) Lumber Testing Room.
Almost lumbers produced from all part of Manchuria were tested. Special effort has been put in finding lumbers suitable for the construction of wooden aeroplane.
- (3) High Temperature Room.
The plan was to construct several type of equipments to give high temperature but interrupted by the war condition.

A chief research was concentrated to prepare glass with inland materials. This purpose was realized by the preparation of sulphate glass. Sodium sulphate can be supplied as the byproduct of rayon industry and salt field. Moreover, over 20,000,000 ton of natural sulphate is found for eight years ago in West Manchuria lake. Silica sand, which does not belong to the first class, was found in Chi-lin province.

- (4) Low Temperature Room.
One of the most characteristic points of our Institute is the Low temperature Room. The construction of this equipment was planned and directed by Professor T. Hode. After 4 years of effort, this equipment was completed in the year 1943. The refrigerating medium is ammonia. The Low Temperature Room composed of three rooms, one big room the motor car can sit and be examined on how the start of the motor is interrupted by low temperature.

The big room can be kept to -74.5°c . Think that triple point of ammonia is 78°c . the completeness if insulation of heat and capacity will be understood.

In Manchuria, communication, homelife, people's sanitary condition are apt to be interrupted by the low temperature of winter. Lowest temperature in Chang-chun is about -37°c . and in Hai-la-lu -50°c .

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(C) Factories

The aim of our factories is the research of industrial technique and self service of our Institute.

(1) Machine shop.

Motor truck with gas generator using bituminous coal was constructed in this shop. Thus we can realize the invention of our Institute by our own hand.

(2) Oil factory.

The oil presses are used for the industrial testing, the tested raw materials are poppy grain, sweet corn germ, grape seed, sunflower seed and etc. Peppy oil was exported to the U.S.A. before the last war.

(3) Plywood factory

This factory was constructed for the aim of rational utilisation of Manchurian hard wood. Plywood for the use of aeroplane was achieved first by this factory.

(4) Glass shop.

For self service.

(5) Purfural factory (under construction).

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