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STATUS OF THE STRATEGIC METALS INDUSTRIES\*

By  
Samuel H. Williston\*\*

Mr. Chairman and Members of the American Mining Congress:

If we are to judge the risk of war by the present status of the strategic metal industries we can feel quite safe in saying that our planners in Washington see no danger within the next ten or twenty years. If on the other hand, we are to judge the possible danger of war from the newspaper accounts and from the appropriation requests to Congress, then it would seem highly advisable that our planners in Washington give a little thought to what we are going to fight a possible war with.

Insofar as the strategic metals are concerned, the operations which were encouraged during the war have since been allowed to die of neglect or else have been deliberately junked. At the present time stockpiling of many of those metals (as we all well know) has sagged well below the irreducible minimum. The statistics make dismal reading.

Manganese, on which our domestic steel industry rests, is obtained from abroad to the extent of ninety percent of our domestic requirements. Close to seventy percent of our domestic requirements comes from countries like the U.S.S.R., India, and Africa. Since domestic consumption is using practically all of western hemisphere production plus imports, the possibility of obtaining metal for stockpiling is somewhat dim and nebulous.

At the present time the Anaconda operations at Butte supply about nine and a half percent of domestic consumption, and four smaller operators in Montana, New Mexico, and Arkansas supply the balance. Imports from Russia alone, of a type not suitable for stockpiling due to physical characteristics, supply twice our domestic production.

Chrome, also of primary importance to the steel industry, is produced in the western hemisphere only to the extent of fourteen percent of our domestic requirements with the balance coming from countries like Turkey, Russia, and South Africa. At the present time not one single chrome operation is producing in the United States and the chrome plants on which much Government money was expended during the war, have been junked or sacrificed. It is even reported that the poor little fourteen percent of production from western hemisphere sources has little or no reserve supply. It took over three years to develop even the beginning of a chrome industry in the first years of the war. I doubt if any considerable portion of our chrome requirements could be obtained from domestic plants in any lesser time if we started to build them today.

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\*Presented at the 1948 Metal Mining Convention, Western Division, The American Mining Congress, San Francisco, California, September 20-23. Reprinted through the courtesy of the American Mining Congress.

\*\*Vice President Cordero Mining Company, San Francisco, California.

The tungsten industry, supplying the basic component for high speed steel and for armor piercing shells, was sacrificed on the altar of reciprocal trade treaties and international goodwill. Production of tungsten in this country has been declining steadily since the war, and three properties are now supplying over eighty-five percent of our domestic production. With foreign material available at \$23.50 per unit, there seems little if any incentive to keep domestic tungsten mines in operation.

The quicksilver industry has fewer mines in operation at the present time than at any time since 1849, and the current rate of production is now below that of the depression years of 1932 and 1933. After October 1, 1948, with the closing of the nation's largest producer, domestic production will be below the 6000 flasks per year of 1921 and 1922 and at the lowest level since the metal was first mined in this country in 1849. After October 1, 1948, we must count on importing over eighty-eight percent of our domestic requirements.

Antimony, the next on the list of strategic metals, is in its best position in years but the hopeful situation in the antimony industry is solely the result of Russian born dissention in China. At the present time, thanks to the single postwar operation of the Bradley Mining Company in Idaho, the United States is producing forty percent of its requirements of virgin antimony metal, but should antimony shipments be resumed from China, there is little possibility that that operation could long continue.

The principal source of platinum metals is Russia, and at last reports consumption and exports of platinum were greater than imports. The gyrations of the platinum market show rather well the effect of Russian control on the source of supply. Strictly domestic production of platinum is non-existent since most of our domestic platinum supply is a by-product from the gold dredges, and supplies from Alaska and Canada are not too significant. Colombian platinum production is not sufficiently flexible to take up the slack in the ups and downs of Russian shipments.

At the beginning of World War II the Germans had fifty submarines which could be detected by radar whenever they surfaced, could be detected by the magnetic airborne detector whether at or below the surface, and gave a good response to echo sounding and ordinary sound detectors. At the present time it is reported that the Russians have two hundred and fifty 20-knot M-21 latest type German submarines which can neither be detected by radar, by magnetic detectors and only with difficulty by echo sounding. If the Germans could sink sixty-five out of sixty-seven cargoes of chrome from Africa, and with communism rampant in some of our maritime unions, how safe are we in depending upon overseas shipments of our strategic metal supplies.

With the announcement by the Munitions Board that their quotas are only eighteen percent complete and seriously out of balance, how long can we fight a war with little if any production domestically of these metals with an average of less than one year's supply and a grave danger of inability to obtain appreciable amounts from overseas through submarine infested waters.

I will not attempt to answer those questions for the simple reason that there is no answer. The facts remain: we have no strategic metal industry, we have an insignificant stockpile, and we have no assurance of supplies from abroad.

As to the status of the strategic metal industry, we all might well ask "what industry?"

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#### ACTIVITY IN LITTLE NORTH SANTIAM AREA

The Little North Santiam area of eastern Marion County has had considerable development activity during the past summer. The Pacific Smelting and Refining Company (formerly the Amalgamated), the Northwest Copper Company (formerly the Lotts-Larson), and the Crown mine all have reportedly been doing underground development work on ore.

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## SPECIFICATIONS FOR CERAMIC MATERIALS

By

C. W. F. Jacobs\*

Introduction

Other than those used as raw materials for structural clay products the ceramic materials to be of commercial importance must possess one or all of the following characteristics:

- (1) Purity - This is the most important, especially that the materials be as iron free as possible, usually below 1 percent and preferably as low as .1 percent in feldspars and flints.
- (2) Volume - In order to make the mined material profitable, it is necessary to have a great volume of uniform composition available. Also it will be of little interest to a consumer unless the deposit is large and uniform.
- (3) Accessibility - If the material is too inaccessible as regards transportation, the entire profit of the venture will be lost in bringing the product out.

The profit that can be made from ceramic raw materials is low in comparison with metals. However, some materials are very necessary to the industry and a few are actually scarce. In the following listings will be found the main ceramic materials and some of the current analyses on present day standard materials of commercial importance.

Feldspars

The closer the chemical composition can approach the theoretical values of the pure feldspar, the greater the value of the material for commercial market.

## Theoretical Composition of Feldspars

- (1) Microcline or orthoclase  
 $K_2O \cdot Al_2O_3 \cdot 6SiO_2$
- (2) Albite  
 $Na_2O \cdot Al_2O_3 \cdot 6SiO_2$
- (3) Spodumene  
 $Li_2O \cdot Al_2O_3 \cdot 2SiO_2$   
This material is rarer but of value if of a good purity and large tonnage.
- (4) Anorthite  
 $CaO \cdot Al_2O_3 \cdot 2SiO_2$   
Some commercial importance.

## Typical Analyses of Four Commercial Feldspars Now on the Market

Source of material	<u>SiO<sub>2</sub></u>	<u>Al<sub>2</sub>O<sub>3</sub></u>	<u>Fe<sub>2</sub>O<sub>3</sub></u>	<u>CaO</u>	<u>K<sub>2</sub>O</u>	<u>Na<sub>2</sub>O</u>	<u>Li<sub>2</sub>O</u>
1. North Carolina	68.7	18.7	0.02	2.0	5.2	5.3	----
2. Ontario - Canada	65.5	19.3	0.05	0.3	11.7	3.0	----
3. Ontario - Canada	59.8	24.2	0.06	0.3	5.1	9.9	----
4. Maine	70.0	22.0	0.5	---	2.9	4.8	1.9

\* Ceramist, Oregon Department of Geology and Mineral Industries.

The most important quality in a good commercial feldspar is a very low iron content, so that the fused specimen of material will be as white as possible.

Other than purity and relative evenness of product composition, the material should be available in large masses of at least 100,000 short tons.

The feldspar should show an even, quiescent fusion over a series of at least 5 cones, from initial fusion to a flat, well-fused, glassy mass of relative transparency or translucency preferably below cone 12 (1310° C. at a 20° C. rise per hour).

Some other minerals used in the ceramic industry are:

Dolomite	$\text{CaCO}_3 \cdot \text{MgCO}_3$
Talc	$3\text{MgO} \cdot 4\text{SiO}_2 \cdot \text{H}_2\text{O}$
Colemanite	$2\text{CaO} \cdot 3\text{B}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$
Cryolite	$\text{Na}_3\text{AlF}_6$
Fluorspar	$\text{CaF}_2$

These materials should be very low in iron, titanium, and other metallic coloring ions. They should be as close to theoretical purity as possible and uniform in supply. Chemical composition is the main test, and working properties in ceramics, when compared to a commercial standard, are also useful in determining the material's relative value.

Clay is by far the most important material to the ceramic industry, although not the most expensive.

#### Theoretical Compositions of Clay Materials

Kaolin	} $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$
Ball clay	
Fire clay	
Andalusites	
Sillimanite	$\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$
Kyanites	$\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$

#### Typical Analyses of Commercial Clays and Andalusites

	<u>SiO<sub>2</sub></u>	<u>Al<sub>2</sub>O<sub>3</sub></u>	<u>Fe<sub>2</sub>O<sub>3</sub></u>	<u>CaO</u>	<u>MgO</u>	<u>K<sub>2</sub>O</u>	<u>Na<sub>2</sub>O</u>
Kaolin A	44.4	39.7	0.3	0.2	0.3	0.7	0.1
B	46.9	38.6	1.0	---	0.2	1.0	0.4
C	45.8	38.2	0.14	0.2	---	---	---
Ball clay A	49.9	31.4	0.6	0.2	0.3	1.2	0.2
B	50.3	31.5	0.6	0.2	0.3	2.0	0.3
C	49.4	32.2	2.3	0.3	---	2.0	0.1
Fire clay A	55	42	.06				
B	53	44	.13				
Kyanite	40.4	57.4	.5	.8			
Sillimanite	36	60	.02				

#### Kaolins (china clays)

Essential characteristics of suitable kaolins are that they shall be white burning, very light in raw color, and possess some grains of weathered feldspar and free SiO<sub>2</sub>. The P.C.E.\* value should be approximately 32 to 33 +. Very low iron content is of primary importance. A reasonable amount of plasticity is required.

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 \*Pyrometric cone equivalent, which is the point at which the material being tested is fused to the same angle of bending as a standard pyrometric cone with which it was heated at a given rate of time to a given degree of temperature.

Ball clays

Uniformity of product is the primary consideration. Purity of product is almost as stringent as is required of the kaolins, but a higher  $\text{Fe}_2\text{O}_3$  content is permitted (1 to 2 percent). Extreme plasticity is essential in order to be classified as ball clay (sedimentary deposit). Ball clay usually contains organic matter, like peat or lignite. The material is always white to buff firing and has a P.C.E. of at least cone 30 or above.

Fire clays

- (1) Material should be plastic to a greater or lesser extent. (This does not apply to diaspore, bauxitic, or flint clays.)
- (2) It must have a total dry shrinkage of less than 7 percent.
- (3) It must have a total firing shrinkage of less than 7 percent.
- (4) There shall be no cracking, bloating, scumming, or warping.
- (5) It must not deform more than 3 to 10 percent under a load of 25 pounds per square inch at a temperature of  $2462^\circ \text{F}$ .
- (6) It should not shrink (after initial forming and firing) in operation at  $2552^\circ \text{F}$ . more than .5 to 2 percent.
- (7) The P.C.E. should be at least cone 32+ ( $3092^\circ \text{F}$ .)

On super-duty clays the limits are much narrower than the above analyses and the P.C.E. shall be at least cone 34.

Other materials of ceramic importance as well as of importance to other industries are:

Bauxite	Ilmenite
Beryl	Pyrophillite
Chromite	Rutile
Cobalt	Zinc
Diaspore	Zircon

These are graded as to purity and amounts commercially available.

The materials of potential ceramic importance are those which contain high lithium compound and any high sodium compound in insoluble form, examples of which are amblygonite, lepidolite, and nepheline syenite.

Prices for commercial ceramic materials vary and depend on the need for the product and the rarity of the material. Any pure material is necessarily worth more than an impure or inferior product.

The average prices paid f.o.b. plant or quarry and processed (washed or air floated) are:

Ball clays . . . . .	\$ 9.00 - 18.00
Kaolin . . . . .	10.00 - 20.00
Fire clay (grade 1 or better) . . . . .	4.75
Feldspars	
F.o.b. crushed and ground to 200 mesh	
and of good purity . . . . .	30.00 - 40.00
Possible higher price for high lithium spar	
Flints	
F.o.b. crushed and ground to 325 mesh and	
very low or no iron content (.10 percent	
or less) . . . . .	18.00 - 30.00

The materials listed and requirements given are average. Prices are average prices paid as of 1947, and can be used only as guides to relative value.

### Sampling of clays

The face of material to be sampled is carefully stripped of overburden (foreign material) and a series of trenches are cut parallel to each other so as to make a vertical section across the face of the outcrop. Each trench should be approximately 12 inches wide and deep enough to produce at least 100 pounds of clay. The samples dug are then mixed, quartered, and a sample taken (no lump over 2 inches in diameter) and shipped for testing. This sample should weigh at least 5 pounds. The rest of the clay should be available for further testing if the clay shows signs of being of commercial importance. The sample should be sent in a cloth sack of tight weave, if possible, and carefully marked by means of two tags, each bearing identification marks. One tag is placed within the bag with the sample, the other secured to the outside of the bag.

### Some commercial clays in Oregon

Besides common clays several deposits of ceramic clays in western Oregon have had commercial production; these are as follows:

1. Sig Fransen clay deposit located 6 miles west of Ranier in Columbia County.
2. Molalla-Salem district in southwestern Clackamas and northwestern Marion counties.
3. Bellfountain locality south of Corvallis and southwest of Monroe in Benton County.
4. Mabel area northeast of the town of Mabel in Lane County.
5. Hobart Butte area south of Cottage Grove in Lane County.
6. Willamina deposit in Yamhill County.

### Conclusion

The materials considered in this article are those which have a sale to the industry as raw materials. Clays used in structural clay products (brick, hollow tile, quarry tile, sewer tile, etc.) are of such low grade, economically speaking, that a manufacturing plant is usually placed near the sight of the deposit and the finished product is sold rather than the raw material.

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### METAL MARKETS

According to the E&MJ Metal and Mineral Markets, New York, issue of October 21, 1948, the demand for practically all metals continues at a high rate. The price of zinc was advanced one-half cent per pound by one seller, making the price  $15\frac{1}{2}$  cents per pound East St. Louis.

The price of copper has remained firm at  $23\frac{1}{2}$  cents Connecticut Valley. Foreign demand for copper has been strong. The Government stockpiling agency suggested that major copper producers allocate a certain part of their production for the Government stockpile. This method, however, did not meet with favor among copper producers, and the suggestion was made that the Government make its purchases through recognized trade channels by men who have understanding of the copper market.

The market price of lead continues at  $19\frac{1}{2}$  cents New York with the price firm and demand strong.

The silver market has been steady with demand about in balance with supply. The New York silver quotation is  $77\frac{1}{2}$  cents per troy ounce. This, of course, applies only to foreign silver as the price of silver produced in the United States is fixed by law at  $90\frac{1}{2}$  cents.

The New York market for quicksilver appears stronger but the price has remained unchanged at \$76 to \$78 per flask. Bids for 3000 flasks of Spanish and Italian mercury in Japan are scheduled to be opened on October 25.

The price of primary pig and ingot aluminum was advanced 1 cent per pound effective October 11, making the price 17 and 16 cents respectively.

The price of tin has remained unchanged at \$1.03 per pound.

Antimony metal is 41.67 cents per pound boxed, New York, and 38.5 cents per pound bulk Laredo.

Following are market quotations for other metals:

Bismuth, per pound in ton lots . . . . .	\$ 2.00
Cadmium, per pound commercial sticks, wholesale quantities . . . . .	1.90
Iridium, per ounce troy . . . . .	110-115
Magnesium, per pound f.o.b. producers' plants, carlots . . . . .	.20½
One hundred pounds or more less than carlots . . . . .	.22½
Nickel per pound electrolytic cathodes f.o.b. Port Colborne, Ontario, contract price . . . . .	.40
Osmium per ounce . . . . .	100.
Palladium per ounce troy . . . . .	24.
Platinum per ounce troy . . . . .	93.
Wholesale lots on sales to consumers . . . . .	96.

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#### NEW DANTORE PLANT ON DESCHUTES RIVER

On October 22 Dant & Russell, Inc., announced that a new million dollar processing plant will be erected at Frieda which is located on the Oregon Trunk railroad on the west bank of the Deschutes River about 13 miles south of Maupin in Wasco County. The plant will adjoin the Lady Frances open pit perlite mine. Besides a new furnace, the plant will include an enlargement in capacity of the present mill and other adjuncts required in producing Dantore products.

Perlite is a gray volcanic glass which has the property of expanding in volume or "popping" when heated to the proper temperature. The product has been given the trade name of Dantore by the company and has been used extensively in construction in the Northwest, notably as plaster sand in the new Equitable and Oregon buildings in Portland.

The announcement by Dant & Russell, Inc., means a new industry for Wasco County and a new town along the Deschutes River. It is reported that about 60 men will be employed at the new plant which is expected to begin operations in June 1949.

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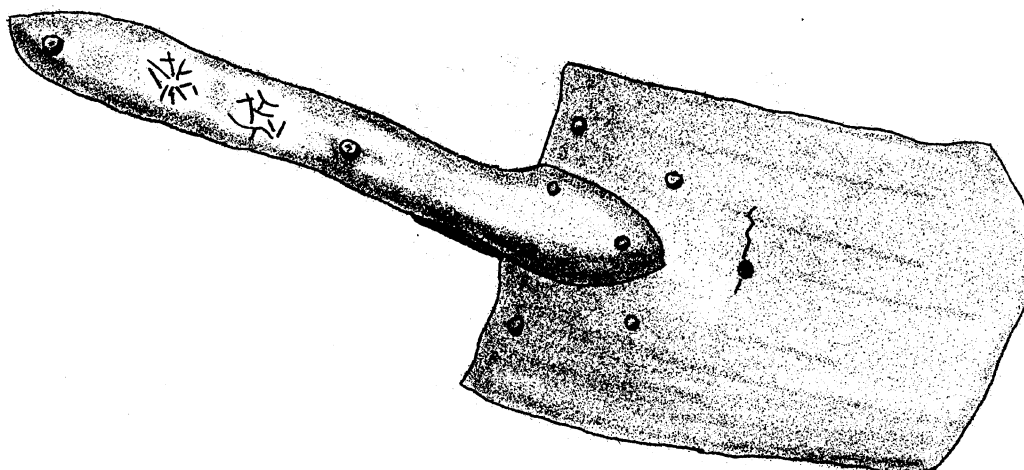
#### GEOLOGY EXTENSION CLASSES

Hollis Dole, geologist for the State Department of Geology and Mineral Industries, is giving a course this year in General Geology at the Portland Extension and at Vanport Extension centers, divisions of the Oregon State System of Higher Education. Mr. Dole reports an enrollment in the two courses of over sixty. Those registered at Portland Extension Center who have indicated their desire to learn more about this Earth Science are from all walks of life and represent all age groups. The majority of those registered at Vanport are veterans.

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## MINING RELIC



Old Chinese shovel found in the Chinese section of the old Auburn townsite by Mr. Leon Brown, Baker, and donated to the Department as a mining relic. The Chinese inscription on the shovel means "good luck" or its equivalent, according to Jack Eng, Baker. Auburn was located about 6 miles west of Baker. The camp flourished in the 1860's and was one of the bonanzas of eastern Oregon. As in other placer camps of Oregon there was an influx of Chinese miners into Auburn in the late 1860's. The Chinese were satisfied with lower-grade ground than the white miners, and in many places they worked over the tailings from previous placer operations.

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## RADIO-ACTIVE MINERAL DEPOSITS ON PUBLIC DOMAIN

The Atomic Energy Commission has announced that mineral deposits on unreserved public domain may be staked even if the deposit shows radioactivity provided the deposit is valuable because of other minerals. The announcement reads as follows:

Uranium in deposits on the public lands, and other lands owned by the United States, is now reserved to the United States, subject to mineral rights established on or before August 1, 1946, (the date of the Atomic Energy Act). However, the Commission's guaranteed minimum prices have been made applicable to deliveries to it of ores containing such reserved uranium in consonance with the Commission's authority to pay fair and reasonable sums, including profits, for discovery, delivery, and other services performed with respect to such ores. The commission wishes to encourage prospecting for new deposits of uranium ores on the public domain and has been advised by the Department of the Interior, which administers the disposition of the public lands, that valid locations may be staked on such deposits if the uranium occurs in a deposit which is valuable because of other minerals. In the unlikely event of the discovery of a deposit of uranium-bearing ore which does not contain some other valuable mineral, the Commission, upon notice, will take steps to protect the prospector's equity.

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## CLEARING HOUSE

CH-103: FOR SALE 340 h.p. S. Morgan Smith Co. double runner hydraulic turbine 39-ft. head, 750 R.P.M. requiring 90 cu. ft. water per second. Located at Montague, Siskiyou County, California. Also 20-in. DeLaval cent. pump, capacity 12600 G.P.M. at 83-ft. head. W. E. Buell, 227 Sherlock Bldg., Portland, Oregon.

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