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EFFECT OF IMPURITIES IN ALUMINUM

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DGS

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The term "danger coefficient" refers specifically to the decrease in k of one percent of an impurity in uranium. In reply to your recent request, a similar table has been compiled showing the relative effect of a given percentage of an impurity in aluminum. However, these values are not absolute as the effect of a given impurity is also a factor of pile position. There is an appreciable difference between the thermal neutron absorption of impurities in the cans compared to the process tubes.

There is no formula for calculation of permissible amounts of impurities; rather the approach has been one of minimizing these impurities with a relatively large cross-section.

In addition to effect on pile reactivity, some elements produce isotopes which are undesirable as corrosion products in the pile cooling water. The most common of these elements are listed below with an arbitrary scale of their relative importance in this regard.

Copper	100
Manganese	45
Vanadium	35
Sodium	10
Zinc	0.5
Iron	0.2

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This information is being forwarded to your office for transmittal to Mr. H. E. Bakken at the Aluminum Company of America as this office is not familiar with their classified document procedure.

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TABLE OF RELATIVE EFFECT ON
K OF IMPURITIES IN ALUMINUM

Element

Lithium	1052
Beryllium	0.112
Boron	7310
Carbon	0.0423
Nitrogen	13.65
Oxygen	0.0062
Fluorine	0.593
Sodium	2.22
Magnesium	1.62
Aluminum	1.0
Silicon	0.695
Phosphorus	1.105
Sulphur	1.575
Chlorine	1.043
Argon	~2.80
Potassium	7.16
Calcium	1.33
Scandium	~49.5
Titanium	12.91
Vanadium	11.8
Chromium	5.11
Manganese	25.59
Iron	5.08
Cobalt	57.2
Nickel	9.57
Copper	6.19
Zinc	2.03
Gallium	~3.23
Arsenic	7.50
Selenium	21.4
Bromine	8.49
Rubidium	~1.31
Strontium	1.92
Yttrium	~1.26
Zirconium	4.31
Niobium	<1.20
Molybdenum	3.50
Ruthenium	~6.64

Element

Rhodium	164
Palladium	~5.26
Silver	62.6
Cadmium	2945
Indium	185
Tin	0.615
Antimony	5.55
Tellurium	3.51
Iodine	6.21
Cesium	29.65
Barium	1.04
Lanthanum	<8.11
Serium	7.95
Praseodymium	7.53
Neodymium	58.4
Samarium	~4250
Europium	~846
Gadolinium	~21550
Terbium	~70.5
Dysprosium	~691
Erbium	34.4
Thulium	~135
Ytterbium	~66.3
Lutetium	~32.4
Hafnium	~96.1
Tantalum	~59.6
Tungsten	15.45
Rhenium	9.15
Osmium	~60.2
Iridium	<5.86
Platinum	~242
Gold	~8.61
Mercury	52.3
Thallium	215
Lead	1.64
Bismuth	.976
Polonium	.861
Thorium	3.86

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