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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		Element	
Lithium	1052	Rhodium	164
Beryllium	0.112	Palladium	~ 5.26
Boron	7310	Silver	62.6
Carbon	0.0423	Cadmium	2945
Nitrogen	13.65	Indium	185
Oxygen	0.0062	Tin	0.615
Fluorine	0.593	Antimony	5.55
Sodium	2.22	Tellurium	3.51
Magnesium	1.62	Iodine	6.21
Aluminum	1.0	Cesium	29.65
Silicon	0.695	Barium	1.04
Phosphorus	1.105	Lanthanum	< 8.11
Sulphur	1.575	Cerium	7.95
Chlorine	1.043	Praseodymium	7.53
Argon	~ 2.80	Neodymium	58.4
Potassium	7.16	Samarium	~ 4950
Calcium	1.35	Europium	~ 846
Scandium	~ 49.5	Gadolinium	~ 21950
Titanium	12.91	Terbium	~ 70.5
Vanadium	11.8	Dysprosium	~ 691
Chromium	5.11	Erbium	34.4
Manganese	25.59	Yttrium	~ 135
Iron	5.08	Thulium	~ 66.3
Cobalt	57.2	Ytterbium	~ 32.4
Nickel	9.57	Lutetium	~ 96.1
Copper	6.19	Hafnium	~ 59.6
Zinc	2.03	Tantalum	15.45
Gallium	~ 3.23	Tungsten	9.15
Arsenic	7.50	Rhenium	~ 60.2
Selenium	21.4	Osmium	< 5.86
Bromine	8.49	Iridium	~ 242
Ruddium	~ 1.31	Platinum	~ 8.61
Strontium	1.92	Gold	52.3
Yttrium	~ 1.26	Mercury	215
Zirconium	4.31	Thallium	1.64
Columbium	< 1.20	Lead	.976
Molybdenum	3.50	Bismuth	.861
Ruthenium	~ 6.64	Thorium	3.86

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