

PRIME Lab recently purchased (in 2023) new niobium powder for mixing with beryllium and aluminum oxides. Our existing powder was always purchased from Alfa Aesar and with their acquisition by Thermo Fisher Scientific, that item became:

AA4051018

Niobium powder, -325 mesh, Puratronic™, 99.99% (metals basis excluding Ta), Ta < 500ppm, ThermoScientific™, 50g

In April of 2024 we cracked open the new bottle and used it to load AMS blank holders for a ²⁶Al run. Fortuitously, one blank holder on the wheel used older Nb powder and one used the newer Nb powder. The holder with the new Nb powder had huge interference numbers and the ratio went from 1 measured using the old Nb powder to 31 for the new Nb powder, with total rare counts rising from 6 to 66. We believe that this newer batch of ThermoScientific Nb powder has relatively high Mg which is a source of ²⁶Mg that is reaching the detector.

The new ThermoScientific powder has a lot number beginning with "Q" and we have tested it on blanks for ¹⁰Be and it adds no interference counts and does not elevate the ¹⁰Be ratio. When mixed with Al oxide blank material, however, it does add interference counts and does elevate the ²⁶Al ratio. Previous bottles of Alfa Aesar Nb do not state the origin but the new ThermoScientific bottle does state that the Nb is a "Product of China." Our feeling is that higher Mg contents are a function of the Nb ore coming from this new source. As such, higher Mg contents are now going to be a feature of this Nb powder and not just a one-time contamination issue.

With some testing and help from Paul Bierman, we have determined that Nb sourced from Beantown Chemical Corporation, catalog number 218315, 325 mesh, 99.99%, will work for AMS. A table that includes all our testing is included below.

User identification	Average Current (nA)	True Interference (cts/sec)	Final Ratio (E-15)	Final Error (E-15)	Sum of Counts	Notes
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Aluminum

Run Date: 4/15/2024

AMS Blank (Nb Unknown)	8444	187	1.112	0.454	6	Alfa Aesar, probably Lot E18W020
AMS Blank (Nb Q15H053)	10651	7650	31.34	3.90	66	ThermoScientific

Run Date: 4/19/2024

Al Blank Nb E18W020	9733	143	0.000	0.289	0	Alfa Aesar
Al Blank Nb E18W020	9628	190	0.322	0.463	1	Alfa Aesar
Al Blank Nb F29L21	9690	235	1.918	0.784	6	Alfa Aesar
AMS Blank (Nb Q15H053)	9862	7011	28.91	4.50	61	ThermoScientific
AMS Blank (Nb Q15H053)	10109	6886	29.65	4.02	55	ThermoScientific

Run Date: 11/22/2024

Bierman NB Al Test	10575	234	1.397	0.539	7	Beantown Chemical Lot 50086454
AMS Blank (Nb E18W020)	7422	133	0.956	0.751	3	Alfa Aesar
AMS Blank (Nb E18W020)	11363	198	0.000	0.256	0	Alfa Aesar

Beryllium

Run Date: 4/30/2024

		See Note				
Phenacite Nb Q15H053	9977	78.3	1.996	0.371	29	ThermoScientific
Phenacite Nb E18W020	10045	82.5	1.651	0.477	12	Alfa Aesar
Phenacite Nb F29L21	9924	78.8	1.379	0.308	20	Alfa Aesar

Run Date: 9/11/2024

Bierman Nb Phenacite Test	9747	1.95	0.606	0.303	4	Beantown Chemical Lot 50086454
Phenacite Blank 2023	9328	1.82	0.844	0.298	8	Alfa Aesar, probably Lot E18W020
Phenacite Blank 2023	9680	1.74	1.059	0.390	13	Alfa Aesar, probably Lot E18W020

Note: Higher interferences (and ratios) for the 4/30/2024 Be run are likely due to a "dirty" source.