Colorado School of Mines Research Institute

P.O. BOX 112 • GOLDEN, COLORADO 80401
PHONE (303) 279-2581 CSMRI

February 22, 1977

CSMRI Project C10704

Mr. William H. Ashton
Johnson & Johnson
Baby Products Company Research
U. S. Route No. 202
Raritan NJ 08869

Dear Bill:

This letter is a report of the results of our examination of talc sample 228P. The purpose of the examination was to identify all minerals present, to estimate the amount of each, and to determine the distribution of Ni, Co, and Cr between talc and nontalc minerals.

SUMMARY

In summary, minerals identified in the sample, at a level of less than 0.1%, were magnesite, dolomite, calcite, pyrrhotite, pyrite, pentlandite, rutile, chromite, and magnetite. Chlorite occurs at a level of approximately 5%. Nickel, cobalt, and chromium all occur in solid substitution in the talc crystal lattice. In addition, nickel occurs as the mineral pentlandite, cobalt occurs in solid substitution in pentlandite, and chromium occurs as the mineral chromite.

DETAILS

A heavy liquid separation at 2.8 specific gravity recovered 0.09% of the sample in the heavy fraction. By x-ray diffraction, this heavy fraction contained major (>50%) magnesite, minor (5-15%) dolomite, and smaller amounts of pyrrhotite, pyrite, chlorite, pentlandite, and rutile.

Electron microprobe examination of a bulk sample identified calcite. Electron microprobe examination of the >2.8 specific gravity fraction identified chromite and a chromium-bearing iron oxide, probably magnetite.

Nickel was determined by microprobe examination to be uniformly present in all talc grains at a level estimated to be 0.1% to 0.2%. In

addition, nickel occurs as the mineral pentlandite (identified by x-ray diffraction and microprobe). A method of selective chemical dissolution was devised to obtain quantitative data on the distribution of nickel between sulfides and talc. Digestion of a bulk talc sample in hot 50% nitric acid was followed by total decomposition in hydrofluoric acid. X-ray diffraction examination of the sample before and after the nitric acid treatment showed it to be unchanged, e.g., talc plus chlorite. Atomic absorption analysis for nickel from the two acid fractions (1. nitric acid soluble, 2. nitric acid insoluble-hydrofluoric acid soluble) gave the following results:

Acid Solution	Ni (ppm)	Wt. % of Sample Dissolved	Comments
1	30	2.4*	Nickel assignable to sulfides
2	2,050	97.6	Nickel assignable to talc

Cobalt was determined by microprobe examination to occur in solid substitution in pentlandite at a level of several percent. However, microprobe examination of numerous talc grains was unable to identify the presence of cobalt. The selective dissolution solutions prepared for determination of the distribution of nickel were also analyzed for cobalt to determine its distribution, as follows:

Acid Solution	Co (ppm)	Wt. % of Sample Dissolved	Comments
1	4	2.4*	Cobalt assignable to sulfides
2	66	97.6	Cobalt assignable to talc

Chromium was determined by microprobe examination to occur as chromite and as a phase interpreted to be chromium-bearing magnetite. Microprobe examination of numerous talc grains failed to detect the presence of chromium. Since chromite is an extremely insoluble mineral, a method of selective dissolution using 1. cold hydrofluoric

*Most of the weight soluble in nitric acid is probably assignable to carbonates.

acid for decomposition of talc, and 2. hot mixed acids for total decomposition of all minerals, gave the following results for chromium:

Acid Solution	Cr (ppm)	Comments
1	100	Chromium assignable to talc
2	440,400	Chromium in bulk sample

A mass spectrographic analysis of 228P, having a detection limit of 0.7 ppm, was run in order to obtain information on the presence of a variety of elements at very low concentration levels. The results are as follows, reported as ppm by weight:

Li	0.9	S	28	Mn	50	As	4
B	0.8	Cl	17	Fe	M	Se	$\ll$1
F	$\sim$310	K	28	Co	130	Br	0.4
Na	M*	Ca	M	Ni	M	Rb	0.9
Mg	M	Sc	$\leq$4	Cu	4	Sr	3
Al	M	Ti	100	Zn	16	Zr	$\leq$3
Si	M	V	10	Ga	1	Mo	4
P	38	Cr	M	Ge	$\leq$1	Pb	$\leq$4

*M = major constituent $\sim$2000 ppm or greater.

We have no further work in progress on 228P. Please contact me if you have any questions concerning this work.

Very truly yours,

Jerry Krause

Jerry Krause
ProjectssManager
Mining Division

/cjm