Table 6 Asbestos and Related Minerals

Minerals	*Formula*	*Color/Luster*	*SG*	*H*	*Crystal system/ habit*	*Occurrences*
Actinolite Greek *actinos = ray* reference to bundles of radiating needles	$Ca_2(Mg,Fe)_5[(OH)Si_4O_{11}]_2$	light green to blackish green; transparent to nearly opaque; vitreous	3 - 3.44	5 - 6	monoclinic; long bladed xls, fibrous or thin columnar aggregates, often radiating	contact and regional metamorphosed dolomites, magnesian limestones, low-grade ultrabasic rocks
Amosite acronym of <u>A</u>sbestos <u>M</u>ines <u>o</u>f <u>S</u>outh Africa	$MgFe_6[(OH)Si_4O_{11}]_2$ (grunerite)	ash gray or brown; vitreous or pearly *brown asbestos*	3.1 - 3.25	5½ - 6	variable fiber length, and a coarse texture	contact and regional metamorphosed iron-rich rocks
Anthophyllite neo-Latin *anthophyllum = clove* for its brown color	$(Mg,Fe)_7[(OH)Si_4O_{11}]_2$	white, gray, greenish, dark brown; transparent to nearly opaque; vitreous to silky	2.85 - 3.1	5½ - 6	orthorhombic; massive, fibrous or lamellar; short harsh fibers with poor flexibility	metamorphic rocks such as schists and gneisses, or metasomatic rocks; often major constituent of rock
Chrysotile Greek *chrysotos = gold* and *tilos = fiber* for its color and nature	$Mg_6[OH)_4Si_2O_5]_2$	white, yellowish green; silky *white asbestos*	2.4 - 2.6	3½	monoclinic; fibrous	vein in serpentine filling veinlets in serpentine as closely packed silky cross fiber forming a complex stockwork
Crocidolite Greek *krokis* or *krokidos = the nap on cloth*	$Na_2Fe_5[(OH)Si_4O_{11}]_2$ (riebeckite)	bluish; silky or dull ; soft to harsh texture; *blue asbestos*	3.2 - 3.3	3½	short to long fibers with good flexibility	riebeckite is granite, syenite, rhyolite, trachyte, banded ironstones, and regionally metamorphosed schists
Tremolite locality at Tremola Valley, St. Gotthard, Switzerland	$Ca_2(Mg,Fe)_5[(OH)Si_4O_{11}]_2$	colorless, white, gray, pale greenish, pink, brown; transparent to translucent; vitreous	2.9 - 3.2	5 - 6	long bladed xls, short and stout; fibrous or thin columnar aggregates, often radiated	contact and regionally metamorphosed dolomites, magnesian limestones, and low-grade ultrabasic rocks

Source: various including Roberts et al., 1990, Virta and Mann, 1994

- ☐ Nos. 1 and 2, long spinning fibers, are used in textiles (now rarely produced)
- ☐ No. 3, spinning or textile fiber, is used in textiles, papers, pipe coverings, insulating blocks, and friction materials
- ☐ No. 4, shingle or asbestos-cement fiber, is used in products including pipes, jackets, sheets, and numerous molded products
- ☐ No. 5, paper fiber, is used in certain asbestos-cement and friction products, as well as in packing material
- ☐ No. 6, waste, stucco, or plaster, is in the same applications as No. 5, although usually restricted to asbestos-cement shingles, flat and corrugated sheets, and putty, plastic, and paper
- ☐ No. 7, refuse, floats, or shorts, is used in certain cements, asphalt roof coatings, paper, welding rods, floor tiles, and putty (Harben, 1995; Virta & Mann, 1994).

GENETIC TYPES

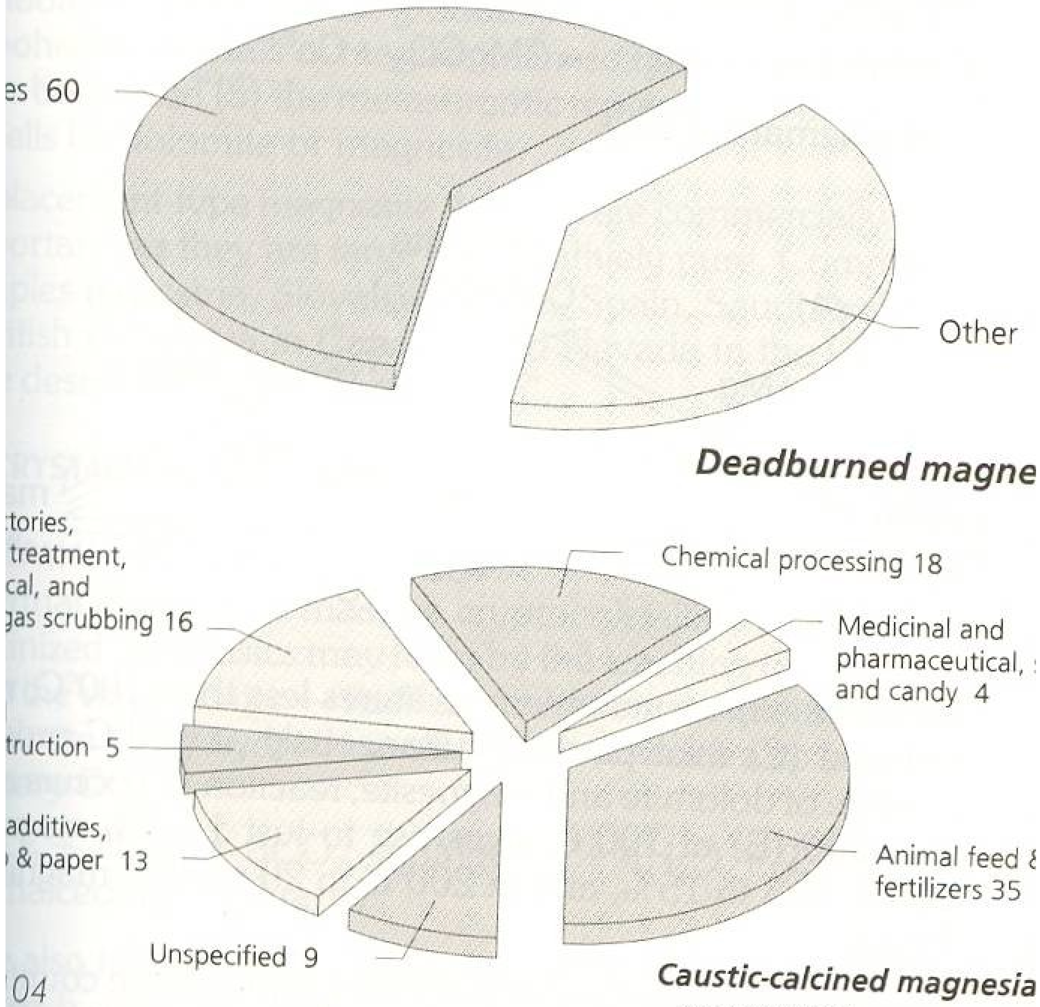
fertilizers, and explosives. Nevertheless, by far the bulk of mag- produced from calcined magnesia in an electric-arc furnace

Table 97 Minerals Containing Magnesia

Minerals	Formula	Color/Luster	SG	H	Crystal system/ habit	Occurrences
Bischofite for Gustav Bischof (1792-1870), German chemist & geologist	$MgCl_2 \cdot 6H_2O$	colorless, white; transparent to translucent; vitreous to dull	1.6	1 - 2	monoclinic; short prismatic crystals, usually granular and foliated, or fibrous	salt deposits (Strassfurt, Germany; Wendover, UT)
Brucite for Archibald Bruce (1777-1818), American mineralogist	$Mg(OH)_2$ 9.1% MgO	white, pale green, gray, gray-blue, blue; transparent; pearly, waxy, or vitreous	2.4	2½	trigonal; broad tabular xls, rarely acicular, foliated massive, fibrous, scaly, fine granular	serpentine, metamorphosed limestones, chloritic and dolomitic schists, assoc. with hydromagnesite, magnesite, talc, calcite, aragonite, or chrysotile
Dolomite for Deodat Guy Silvain Tancrède Gratet de Dolomieu, French geologist	$CaCO_3 \cdot MgCO_3$	colorless, white, grayish, greenish, pale brown, pinkish; transparent to subtranslucent; vitreous to pearly	2.9	3½ - 4	trigonal; simple rhombohedrons, often curved faces; massive fine to coarse granular	strata of varying origin; hydrothermal vein deposits; cavities or veins in limestone or dolomitic rocks; veins in serpentine; altered basic igneous rocks containing Mg
Epsomite locality at Epsom, near London, England	$MgSO_4 \cdot 7H_2O$	colorless xls; transparent; vitreous; aggregates white, pinkish, greenish; translucent; silky to earthy	1.7	2 - 2½	orthorhombic; rarely as xls; synthetic xls short prismatic or equant	efflorescence on walls of mine workings, limestone caverns, sheltered magnesian rock outcrops; waters of salt lakes and mineral springs; oceanic and lacustrine salt deposits; as a fumarolic deposit
Magnesite Latin magnesia, from Magnesia in Thessaly, Greece → magnesia alba → "magnesia"	$MgCO_3$ 47.8% MgO	white to black, gray, blue (crystalline), white to buff, yellow (cryptocrystalline); transparent to translucent; vitreous	2.9 - 3	3½- 5	trigonal; xls uncommon; commonly massive, compact, coarse or fine-grained, chalky to porcelaineous	alteration product of magnesium-rich rocks; sedimentary deposits; as a gangue mineral in hydrothermal ore veins; as a primary mineral in igneous rock
Huntite Walter Frederick Hunt (1882-1975), mineralogist, U of Michigan, Ann Arbor	$Mg_3Ca(CO_3)_4$	white; earthy	2.7	soft	trigonal; compact chalk-like masses, very fine grained and fibrous	cave carbonate in Mg-rich rock areas; near surface weathering product of Mg-rich rocks like brucite, marbles, dolomites, serpentinites, or magnesites; as diagenetic mineral in Recent sediment sequences
Hydro magnesite See above plus *hydro* = *water*	$Mg_4(OH)_2(CO_3)_3 \cdot 4H_2O$	colorless, white; transparent with vitreous xls	2.5	3½	monoclinic; acicular or bladed xls, in sprays, rosettes, or crusts; massive, powdery, chalk-like	alternation of serpentine or other magnesium rocks
Periclase Greek *peri* = *around* and *klasis* = *fracture* due to its perfect cubic	MgO	colorless, white, gray, yellow, brownish, green, black; transparent; vitreous	3.56 - 3.58	5½	cubic; octahedral xls, commonly as rounded grains	marbles as a high-temperature metamorphic mineral

Forsterite and fayalite - see olivine; kainite, langbeinite, leonite, polyhalite - see potash; D' Ansite. vanthoffite, and loeweite - see sodium sulfate
Source: various including Roberts et al., 1990

compounds in the United States (%)



Source: USBM (1993)

04

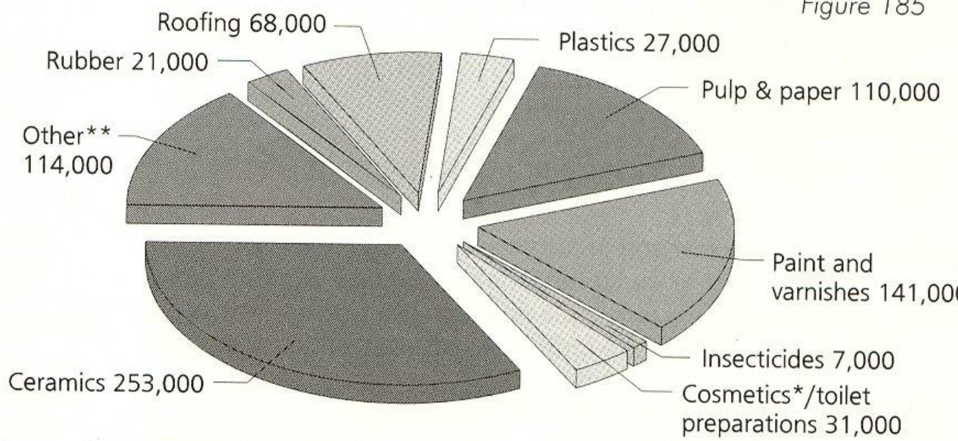
1987). As only a few magnesites can meet these re-
nts, much of the raw material is "synthetic magnesia"
rom seawater.

and cosmetic uses.

Talc is used extensively as a filler in paint, plastics (especially polypropylene and polyethylene), paper, rubber, adhesives, joint compounds, stucco, and pharmaceuticals. In the paint industry, which accounts for up to 20% of its commercial consumption, talc is used to extend the more expensive titanium dioxide pigment. In certain paints, talc also contributes to oil absorption, viscosity, flatting and sheen control, suspension characteristics, chemical resistance, and dispersion of the pigment. Emulsion paints use a -325 mesh grade of talc, whereas anti-corrosion and automotive paints require micronized grades. A growing use is in plastics, where talc not only reduces the quantity of resin required but also has a strong reinforcing effect, increases heat resistance, reduces mold shrinkage and cycle time, and improves melt rheology. In polypropylene, for example, talc increases stiffness and resistance to high-

Consumption of talc in the United States
(tonnes)

Figure 185



* incomplete data for the USA, some cosmetic talc included in other; ** includes art sculpture, asphalt filler and coatings, crayons, floor tiles, foundry facings, rice polishing, stucco, and other uses not specified;

Source: USBM (USA) EMR (Canada)

Table 173 Talc

Minerals	*Formula*	*Color/Luster*	*SG*	*H*	*Crystal system/ habit*	*Occurrences*
Talc (steatite) Arabic *talq*; Greek *steatos = suet*	$Mg_3Si_4O_{10}(OH)_2$	pale to dark green, white, silvery white, brownish; translucent; pearly or dull; greasy feel	2.58 - 2.83	1	monoclinic and triclinic; thin tabular xls, massive, fine-grained compact; foliated for fibrous masses	secondary as hydrothermal alteration of ultrabasic rocks; thermal metamorphism of siliceous dolomites

Source: various including Roberts et al., 1990 postage stamp coated with kaolin in the thickness of a human

Consumption of ball clay in the United States

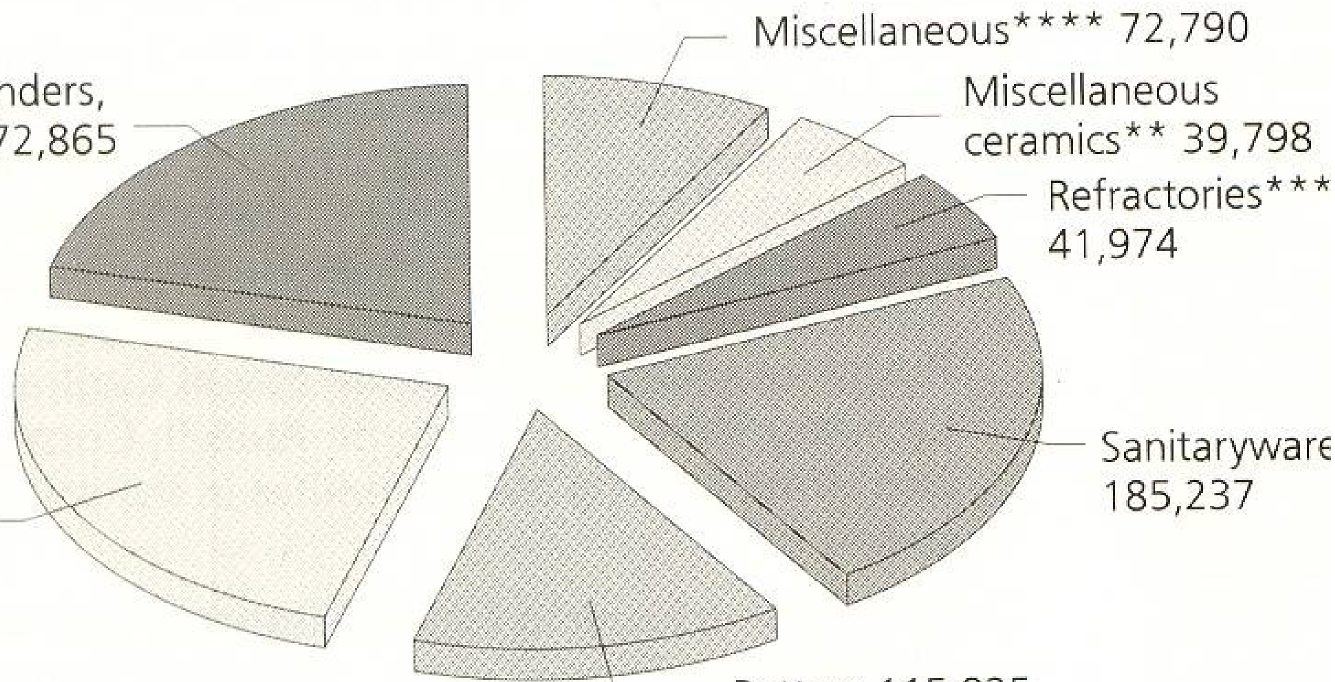


Figure 53

Source: USBM (1993)

* includes adhesives, animal feed, asphalt tile, paint, paper filling, plastics, rubber, asphalt emulsions, wallboard, etc.

** includes electrical porcelain, fine china/dinnerware, and miscellaneous ceramics;

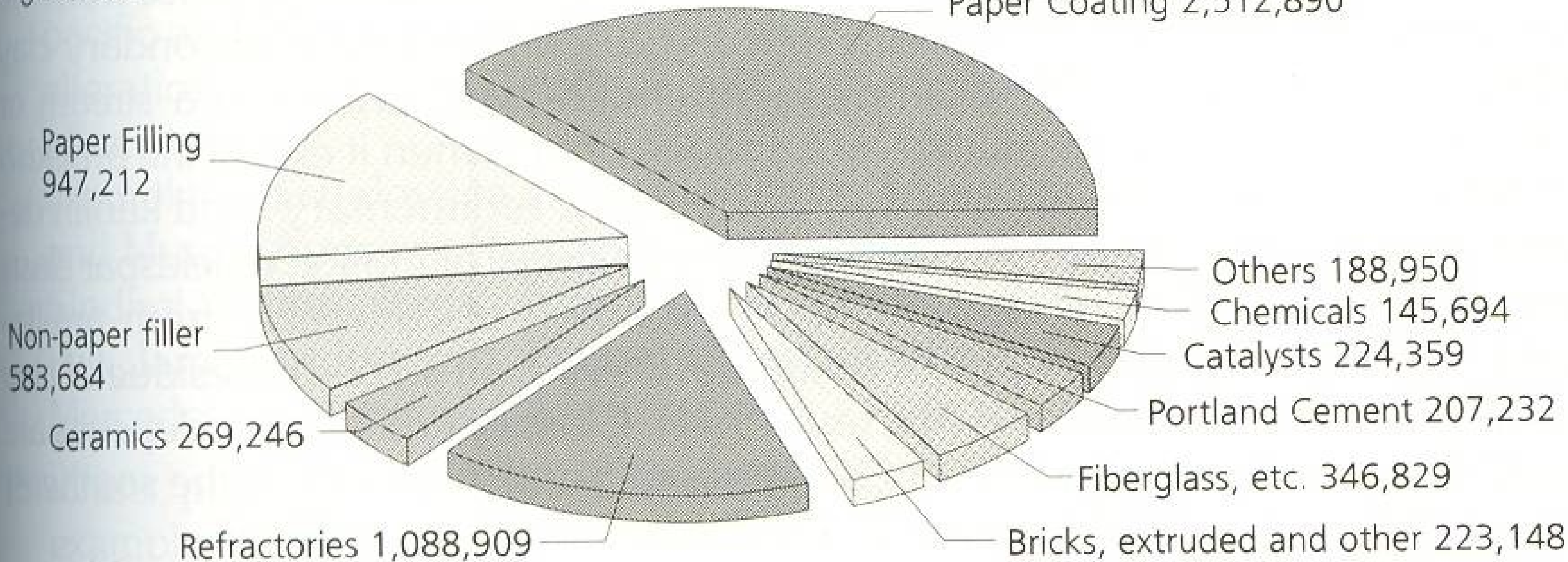
*** includes firebrick, blocks, and shape, high-alumina brick and specialties;

**** includes heavy clay products, absorbents, waterproofing seals, brick (common), flue lining, and uses unknown.

Consumption of kaolin in the United States

(tonnes)

Figure 52



Source: USBM (1993)

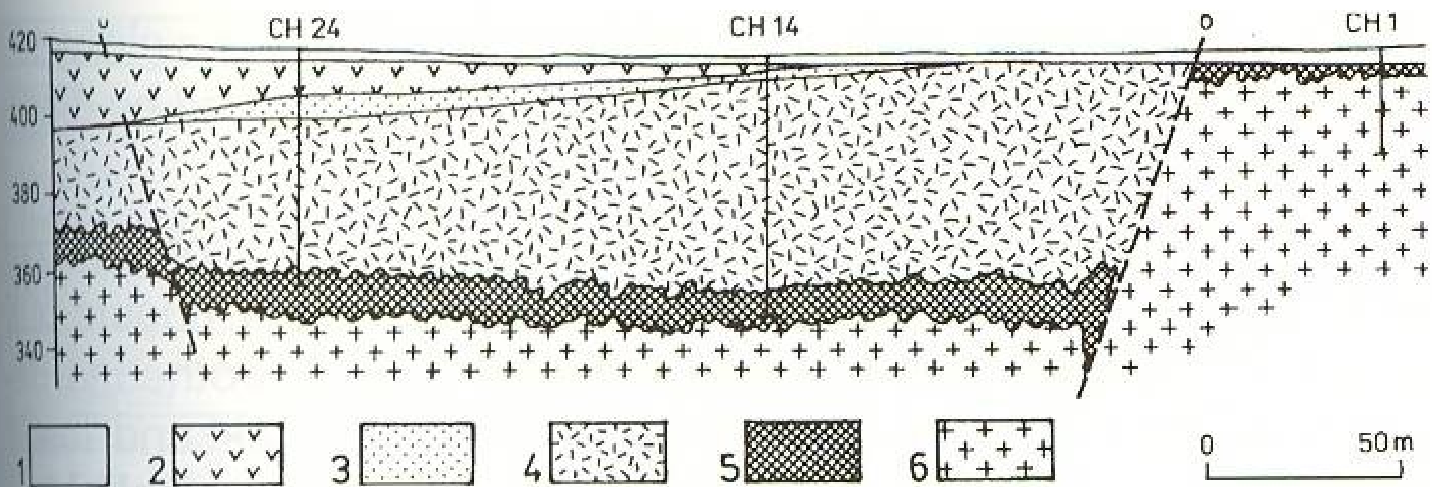


Figure 58 *Vertical section through the Capíhnízdo kaolin deposit north of Karlovy Vary, Czech Republic (P. Hrzina).*

1 - Quaternary loams; 2 - tuffs and tuffites of the volcanodetrital sequence Oligocene); 3 - sands and clays of the Stard Sedlo Formation (Middle Oligocene); 4 - primary residual kaolin; 5 - intensely kaolinized granite; 6 - biotite granite.