Mineralogy and Origin of the Coalinga Asbestos Deposit

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Abstract: Since 1960 asbestos production of the United States has more than tripled, a phenomenon due in large part to the development of the Coalinga asbestos deposit in western California. Although most asbestos ores contain 5 – 10 per cent chrysotile in the form of cross- or slip-fiber veins within massive serpentinite bodies, no such veins are to be found in the Coalinga deposit despite the fact that it contains more than 50 per cent recoverable chrysotile. The Coalinga ore consists of soft, powdery, pellet-like agglomerates of finely matted chrysotile surrounding blocks and fragments of serpentinite rock. The highly sheared and pulverized nature of the ore favors its exploitation by simple, open-pit mining, and high quality products can be prepared by either wet or dry milling processes.

Four types of serpentine material are distinguishable: (1) hard, dense blocks of serpentinite rock, ranging from fractions of an inch to several tens of feet in diameter; (2) tough, leathery sheets, resembling mountain leather, up to several square feet in size; (3) brittle blades and plates of green serpentine, a few square inches in size; and (4) friable agglomerates of soft, powdery chrysotile containing appreciable amounts of the other three. Chrysotile is the principal component of all the above materials, with the exception of the serpentinite rock which consists mainly of lizardite and/or antigorite, with small amounts of brucite, magnetite, and very short fiber chrysotile. Although chrysotile fibers up to several microns in length are present in the leathery sheets, most Coalinga chrysotile is much shorter and arranged in a swirling mesh or disoriented, tangled fibers, much like cellulose fibers in paper. Fragments of serpentinite gangue are scattered throughout the ore and contain most of the lizardite, antigorite, and brucite. Chemical, electron probe, and X-ray analyses confirm the iron-rich nature of the brucite, a critical factor in the susceptibility of this phase to oxidation in the surface weathering zone. Here brucite either dissolves, leaving behind a residue of brown, amorphous iron oxides, or transforms *in situ* to pyroaurite or coalingite. Dissolved magnesium precipitates as hydromagnesite immediately above the water table throughout the deposit.

The abnormally high chrysotile content of this deposit is probably a result of the intensive shearing that it underwent during or after emplacement. If the friable, chrysotile-rich ore was produced during this pulverization episode, (1) lizardite and/or antigorite in the serpentinite must have been transformed into chrysotile and (2) brucite must have been removed. It is likely that early-formed lizardite/antigorite dissolved in the ground waters which pervaded the highly sheared body and that chrysotile later precipitated from these waters, coating all available surfaces.

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