Preliminary Descriptive Model of Lacustrine Gypsum

BRIEF DESCRIPTION

Deposit synonyms: Bedded gypsum.

Principal commodities produced: Gypsum, (anhydrite).

By-products: None.

End uses: Calcined gypsum (plaster of Paris) -- Wallboard (70% of gypsum use); soil conditioning; Portland cement; fillers.

Descriptive/genetic synopsis: Continental evaporite deposits formed in lacustrine basins in semiarid to arid climates. Gypsum deposits of lacustrine origin occur in continental basins of many sizes. These deposits may be of large areal extent and (or) of considerable thickness, but are, on average, smaller than marine bedded gypsum deposits. Deposits formed in playas and coastal sea-water lakes are included in this model.

Typical deposits: Fish Creek Mountains deposit, USCA
Lake Brown, AUWA
Ballah, EGPT

Relative importance of the deposit type: Important only locally where marine bedded gypsum deposits are not available; for example, Australia.

Associated/related deposit types: May be spatially associated with other lacustrine deposits including other lacustrine evaporites and brines, lacustrine borates, clays, and zeolites.

REGIONAL GEOLOGIC ATTRIBUTES

Tectonostratigraphic setting: Convergent plate boundaries, extensional terranes, and other settings conducive to basin formation.

Regional depositional environment: Closed to semi-closed basins, typically structural basins.

Age range: Largely Tertiary to Recent, but in rare cases may be as old as Paleozoic.

LOCAL GEOLOGIC ATTRIBUTES

Host rock(s): Lacustrine carbonates, shale, and evaporites.

Associated rock(s): Anhydrite, halite.

Ore mineralogy: Gypsum, (anhydrite-- anhydrite content commonly increases with depth). Commonly interlaminated with gangue minerals.

Gangue mineralogy: Calcite, halite, clay.

Alteration: Gypsum may form from hydration of anhydrite.

Structural setting: Basins commonly fault-controlled.

Ore control(s):

-- Closed to semi-closed structural basins;
-- Source of salines within basin;
-- Water inflow over time is large enough to introduce significant quantities of dissolved material, i.e. lead to saline brine formation;
-- Arid to semi-arid climate allowing sufficient evaporation to form brine concentrations.

Typical ore dimensions: Ore thickness may exceed 30 m.

Typical alteration/other halo dimensions: N/A

Effect of weathering: Weathering leads to dissolution of gypsum exposed at the surface in most climates, but gypsum will be preserved at the surface in more arid climates.

Effect of diagenesis/metamorphism: Metamorphism leads to eventual destruction of the deposit and alteration of surrounding rocks.

Maximum limitation of overburden: Not known, but gypsum is a low value product and only minimal overburden can be economically removed from a deposit.

Geochemical signature(s): No distinctive signature.

Geophysical signature(s): No distinctive signature.

Other exploration guide(s): Sulfates, including gypsum, can be identified using remote sensing imagery.

Most readily ascertainable regional attribute: Closed or semi-closed basin.

Most readily ascertainable local attribute: Saline mineral efflorescences; presence of aragonite.

ECONOMIC LIMITATIONS

Physical/chemical properties affecting end use: Gypsum is the main ore mineral and it must have a low level of impurities. Anhydrite is commonly considered to be a contaminant and its uses are largely speculative although small amounts have been produced.

Compositional/mechanical processing restrictions: Material purity must be high enough to minimize the need for physical beneficiation.

Distance limitations to transportation, processing, end use: The low value of this commodity and its products can severely limit shipping distances.

SELECTED REFERENCES

Blatt, Harvey, Middleton, Gerard, and Murray, Raymond, 1972, Origin of sedimentary rocks: Englewood Cliffs, New Jersey, Prentice-Hall Inc., 634 p.

Burnett, J.L., 1984, Mineral Commodity Report-- Gypsum-- 1984: California Division of Mines and Geology Special Publication 72, 15 p.

Dickson, Ted, 1978, Gypsum--building from the depths: Industrial Minerals, no. 130, p. 17-31.

Harben, P.W., and Bates, R.L., Gypsum, in Industrial minerals geology and world deposits: London, Industrial Minerals Division of Metal Bulletin Plc, p. 130-137.

Raup, O.B., 1991, Descriptive model of bedded gypsum; Deposit subtype: Marine evaporite gypsum (Model 35ae), *in* Orris, G.J., and Bliss, J.D., 1991, Some industrial mineral deposit models: descriptive deposit models: U.S. Geological Survey Open-File Report, p. 34-35.

Smith, G.I., 1966, Geology of Searles Lake--a guide to prospecting for buried continental salines, *in* Rau, J.L., eds., Second Symposium on Salt, volume 1: Cleveland, Ohio, The Northern Ohio Geological Society Inc., p. 167-180.