

Borates in Gold Metallurgy

The mined ore is sorted, crushed, milled, and classified. A concentration procedure is then employed such as gravity concentration or flotation followed by cyanidation or amalgamation. The impure gold concentrates are then subjected to processes such as oxidation, sulphurization and smelting, in order to remove base metals and produce gold bullion.

Dehybor[®] Anhydrous Borax is used in the gold refining industry as part of flux formulations to dissolve metal oxides; also as a flux in gold assaying.

Gold ore types

Ore grades are divided into three fundamental divisions:

- Acid gangues which consist mainly of silica.
- Basic gangues which are largely calcareous, including oxidizing ores with high contents of divalent metals; e.g. iron.
- Reducing ores such as pyrites.

Borates are used in each of these ore types for:

- Facilitating attack of the ore at a lower temperature.
- Making the slag more fluid at the furnace operating temperature – reducing viscosity.



Refining of pure gold from bullion

Bullion ingots are melted in clay crucibles under an anhydrous borax cover. Oxygen is passed through the metal which then forms oxides of the impurities. These oxides dissolve in the *Dehybor* cover and produce a fluid borate slag. This slag is periodically removed and replaced with fresh *Dehybor*. Further refining steps are then carried out to produce bars which assay at least to 998 fine gold (i.e. 99.8% pure).

Addition rates of borate

The addition of *Dehybor* to the smelt is in the order of 10-50% of total smelt

weight, depending on the process. The borax contribution to flux composition can be up to 60% of total flux weight but is typically around 30-40%.

Benefits of Dehybor use in gold refining

- The precious metal content is recovered with minimal loss to the slag.
- Inclusion into basic fluxes for use on acidic ores promotes a substantial reduction in sintering temperature of the charge.
- The powerful solvent effect on many oxides produces easily fusible borates.



Dehybor[®] Anhydrous Borax

- Non-combustibility with minimum fuming tendency.
- Formation of highly fluid slags with only mild attack on refractories.
- Ease with which the slag can be thickened if necessary and slammed.
- Avoids intumescence and puffing.

Requirements of borates for fluxes

- Low impurities – impurities delay smelting process in gaining temperature.
- Consistent granulometry (like sugar grains) – if the borate is too fine it will run into the electrodes and burn away; if too coarse, it melts too slowly.
- To prevent “spit and crackle” problems, the flux should be anhydrous.

About the company

Rio Tinto Borax supplies nearly half the world's demand for borates from its principal mine in California. The company offers an integrated approach to mining, refining, and distributing borates, as well as:

- Strategic Inventory Placement and long-term contracts with shippers to ensure supply reliability.
- Acknowledged world leadership in borate chemistry and technology development that translates to unparalleled technical support for customers.
- Consistent product quality supported by ISO 9000 registered Quality Management Systems, statistical process control and Certificates of Analysis.

About the products

Borates are naturally-occurring mineral salts, essential for plant life and part of a healthy diet for people. Borate products have an excellent reputation for safety – and a long track-record of being safe when used as directed.

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