

Differing magnetic properties are used to split the conductive minerals into individual constituents. The non-conductors are processed through magnetic and wet gravity separations to produce zircon, a monazite concentrate and a non-valuable heavy mineral fraction.

Crossbelt magnetic separators are used to separate materials of greatly different magnetic susceptibility and induced roll magnetic separators are applied for more subtle differentiation.

5.3 Synthetic Rutile Plant

The high TiO_2 content feedstocks, rutile and some grades of leucoxene, are fuel for the chloride process pigment plants. Relatively minor sources of ilmenite are suitable for direct chlorination although ore grade ilmenite deposits are in abundance compared with sources of natural rutile.

Ilmenite can be utilised in the chloride pigment process by first upgrading it to synthetic rutile. For Cooljarloo ilmenite, the Improved Becher Process achieves an increase in TiO_2 content from 62% to 92% by transforming it to synthetic rutile through the removal of iron and manganese oxides.

The Becher process reduces iron and manganese oxides to metallic or a sulphidised form in a sulphurous atmosphere, high temperature, coal-fuelled rotary kiln. The process also produces partial reduction of TiO_2 to Ti_2O_3 and creates a porous crystal structure in the reduced ilmenite.

The iron manganese sulphide is leached from the ilmenite grains with weak sulphuric acid.

Dissolution of the metallic iron phase takes place in an aerated, aqueous bath using an ammonium chloride catalyst. The metallic iron diffuses through the porous network of the ilmenite to the grain surface where it is oxidized to insoluble Fe_2O_3 . The remnant grain with the iron and manganese salts removed is synthetic rutile with approximately 90-94% TiO_2 content.

Precipitated iron oxide is separated from synthetic rutile in hydrocyclones. The product is subjected to a final leaching in weak sulphuric acid to remove manganese and any residual metallic iron before washing and drying to a saleable form.