

EXTRACT FROM "PRODUCTION OF HYDROGEN FLUORIDE"
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2.3.3 Ammonium Sulphate Roasting

A schematic flow sheet is given in Fig. 5.

Run-of-mine fluorite ore is recovered from stockpile, crushed, and finely ground in a dry mill. Together with excess ammonium sulphate, the ground ore is fed to an externally heated rotary kiln. The following reactions occur at a temperature of 400°C during a residence time of 2 h.



With the exception of gypsum, gangue and unreacted ore, all the reaction products are gaseous at 400°C and are removed from the kiln by admission of a purge gas. The hot gases pass to an absorber which operates at neutral or slightly acid pH to absorb the reaction gases. Purge gas and unabsorbed reaction gases are vented to atmosphere via a scrubber. The absorber liquor passes to a stock tank in which the liquor pH is raised to pH 9 by addition of ammonia. Silica is precipitated via the following reaction.



The precipitated silica is removed on a filter, and the clean liquor passes to a stock tank. Liquor from the stock tank is pumped to the crude HF still, together with sulphuric acid. The following reaction liberates HF which is distilled as an azeotrope.



The distilled gases are condensed and fed to the AHF still, in which anhydrous HF is recovered by distillation over concentrated H₂SO₄. Non-condensable gases are vented to atmosphere via a lime scrubber. The bottom liquor from the crude HF still consists of (NH₄)₂SO₄ solution which is pumped to a crystalliser for recovery and recycle to the kiln.