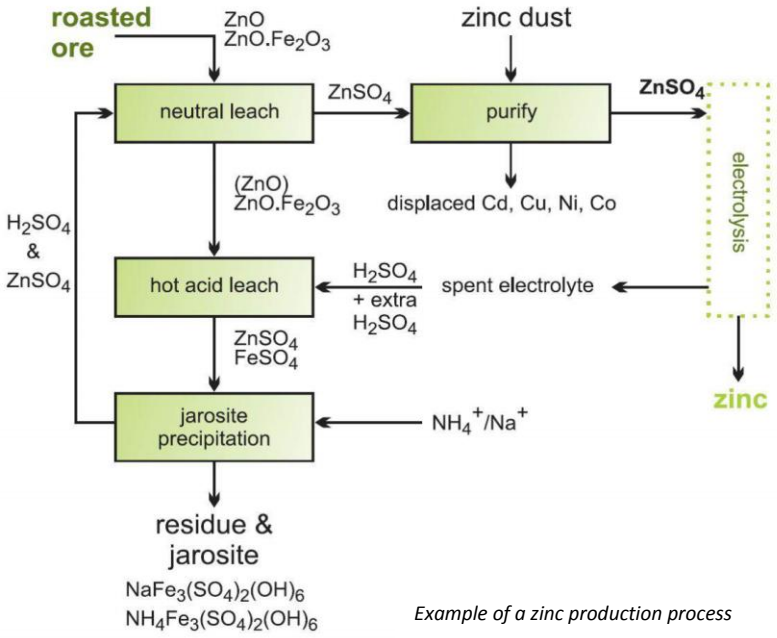
Zinc production: Analysis of Zinc, Sulfuric acid and Iron

Over 95% of the world's zinc is produced from zinc blende (ZnS). Before metallic zinc can be recovered, by using either hydrometallurgical or pyrometallurgical techniques, sulfur in the concentrate must be removed. This is done by roasting or sintering at high temperature (>900°) where zinc sulfide (ZnS) converts into the more active zinc oxide (ZnO). In a leaching stage (hot acid leach) the zinc oxide is separated from the other calcines using sulfuric acid (spent electrolyte) to form zinc sulfate ($ZnSO_4$) and water. The zinc content dissolves whereas iron precipitates and lead and silver remain undissolved. However, the dissolved solution contains some impurities which need to be eliminated in order to obtain a high-purity zinc product at the end of the production process. First and second stage purification prior to electrolysis is carried out by zinc dust precipitation or cementation. The resultant purified neutral zinc sulfate solution is electrolyzed in the cell room to produce zinc metal.
In several stages ADI Process Analyzers are used to determine the acid, zinc and ferric concentrations for completion rate monitoring. Impurities like nickel, cobalt, copper, cadmium, antimony and germanium are measured with the dedicated ADI2045VA Process Analyzer in the purification filtrates and reactor trains. This Analyzer is also used for environmental monitoring of trace metals in the zinc plant effluent.



Example of a zinc production process

Application: The acid concentration is a simple acid/base titration while the zinc concentration is analysed by a complexometric titration. The ferric iron is analysed by a redox titration. All trace metals are measured by voltammetry.

Typical Range: Zn^{2+}: 10-90 g/L, 0-2 mg/L; H_2SO_4: 50-200g/L
Trace Metals: < 50 µg/l & lower

Remarks: The 2045VA Analyzer for trace metal analysis can measure down to levels as low as ppb.

Keywords: zinc production, acid leach, sulfuric acid, iron, roasting, trace metal analysis,
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