

Characterization of Metallurgical Slags

“Make a good slag and the metal looks after itself”

This old adage is as true today as it was 100 years ago, but modern operations can run their operations using informed data on what constitutes a “good” slag.

- The physical properties of metallurgical slags - liquidus, viscosity, density and conductivity in particular need to be carefully controlled if smelting operations are to achieve maximum metallurgical performance out of their pyrometallurgical plant.
- Measurement of these properties can be tricky, but XPS Extractive Metallurgy group have many decades of experience in the precise measurement of these properties under carefully controlled laboratory conditions where reliable and reproducible data is essential.
- Smelters and metallurgical plants can use these facilities not only to optimize their target slag chemistry, but also to monitor their existing operational performance by submitting production samples to XPS for characterization.
- The lab results are supported and extended by modelling of properties using the extensive FactSage™ thermochemical database and XPS's own plant data to extrapolate or interpolate data as a cost-effective alternative to unnecessary additional lab testing.



Key Capabilities

Viscosity

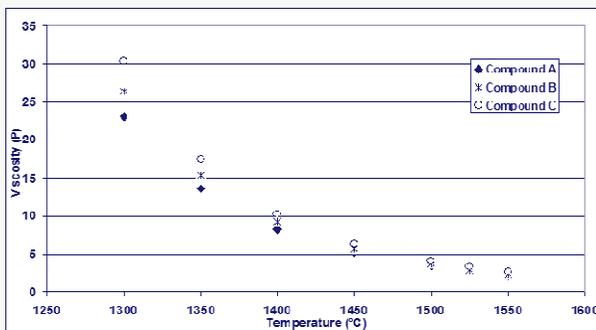
Measurement of slag viscosity is notoriously difficult, time consuming and expensive, as many research pyrometallurgists can confirm. While viscosity measurements at room temperature are difficult enough, measurements at temperatures exceeding 1500°C and requiring gas tight conditions, of an aggressive and corrosive fluid are not for the faint hearted!

XPS has retained the expertise gleaned over decades of tough testing, and built up an impressive library of viscosity data which permits a minimum number of lab tests to confirm reference values in order to extend data through much wider ranges, while reducing costs to the client.

Electrical Conductivity

For electric furnaces, the correct range of electrical conductivity of the slag is vitally important if furnace productivity or efficiency are not to suffer. Too high a conductivity can result in over-current, and too low a conductivity may require high transformer tap settings, both conditions possibly limiting power input.

In order to measure conductivity, XPS have a dedicated high temperature furnace, equipped with controlled atmosphere seals and electrodes carefully calibrated against known standards for the actual conductivity determinations.



Liquidus

Slag liquidus temperatures are well publicized for slags with simple chemistries, but unfortunately few pyrometallurgical smelting operations function with the simple slags published in literature. Small amounts of additional components can have a dramatic effect on viscosity. In addition relatively small changes in pO₂ levels in the slag can have a dramatic effect on slag viscosity.

Beside well equipped lab facilities, XPS have an extensive database of actual plant slag measurements which have been used to populate liquidus-prediction models based on both the plant data and published reference material for comparison. This is particularly useful for smelters needing an estimation of the likely effect of a new feed material on slag tapping temperatures.

