

Temperature Modelling in a Furnace

MISG 2023



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What is Pyrometallurgy?

- Extraction of metals from their natural mineral deposits
- Thermal treatment of ores and concentrates
- Bring about chemical and physical changes
- Recovery of valuable materials

Specifically, we will be considering a smelting process

Thermal reactions where products are in a molten phase



Problem Statement

The Challenge

- Pyrometallurgical conversion is a volatile process
- Running the furnace at the wrong temperature can cause an eruption or explosion
- Temperature is measured very infrequently

Proposed Solution

• Create a mathematical model that models the temperature of the bath in space and time

 $T \sim T(r, z, t)$



- Furnace model
- Physical components
 - Lance
 - Slag bath
 - Matte bath
 - Tap holes
 - Refractory layer
 - External heat exchangers



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- Furnace model
- Process properties
 - Lance
 - Submerged in slag bath
 - Feeds air and fuel into process
 - Slag Bath
 - Well-mixed
 - Turbulent, chaotic
 - Chemical reactions
 - Matte Bath
 - Molten, but stationary



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Thank you

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Colours

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