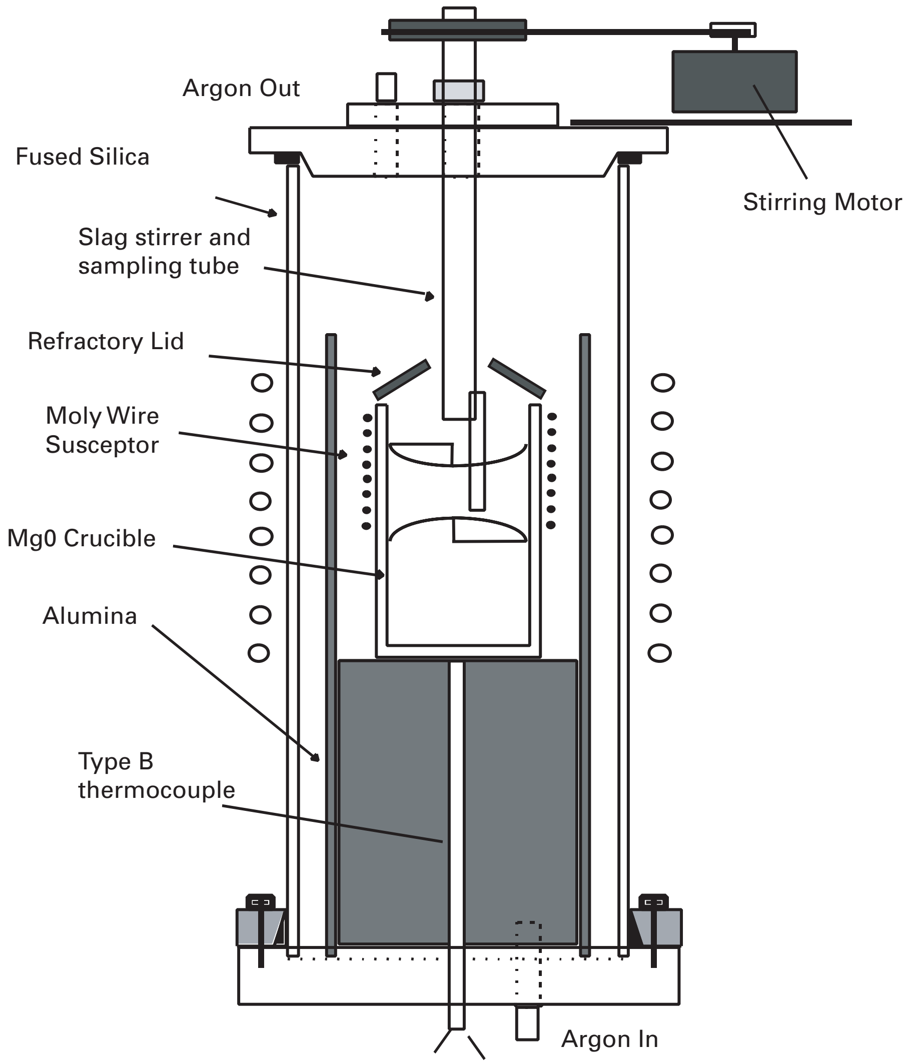
9815 Phosphorous Removal in an EAF When Using DRI/HBI

Benefits
Successful completion will result in the following:

- ❖ The iron yield is increased because slag flushing is minimized.
- ❖ Phosphorous reversion from the slag to the steel is reduced, enabling the use of high phosphorus DRI/HBI.
- ❖ In addition to greater availability, the cost of such DRI/HBI may be lower by $8-$16 per ton.
- ❖ Use of DRI/HBI in steelmaking reduces greenhouse emissions since natural gas is used in the production of DRI/HBI.

Application
Primarily applicable to EAF Steelmaking.

The increased production of high quality steels in the electric arc furnace (EAF) requires the use of scrap substitutes such as direct reduced iron (DRI) and hot briquetted iron (HBI). Production of DRI/HBI using natural gas instead of coke, reduces the greenhouse gas emissions by 50-75%. Although DRI/HBI products have lower contents of copper, nickel, etc. than scrap, they can contain five to ten times as much phosphorous. As a result, the phosphorous content of the steel may be too high. The objective of this research is to develop a real-time, online process model to optimize phosphorous removal when using DRI/HBI.



Project Description

Goals: The objective of this project is to understand the behavior of phosphorous in DRI and HBI, the basic reactions for its removal into the slag, and to develop a computer model that predicts the behavior of phosphorous in an EAF when using DRI/HBI. This model will be verified through plant trials. The research consists of characterizing the phosphorous in the DRI/HBI, fast melting experiments to determine if it goes to the slag or metal, and fundamental laboratory experiments on the kinetics of the reactions. Two sets of plant trials are planned. The first is to determine the mass transfer parameters for an actual EAF; the second is to test a phosphorous model that will be developed.

Progress and Milestones

Task I: Experimental Setup
Run initial phosphorous and reaction experiments.

Task II: Plant Trials
Conduct trials to determine mass transfer parameters at two or more plants.
Conduct plant trials on phosphorous reactions.

Task III: Modeling
Develop reaction model.
Develop EAF model.

Task IV: Technical Transfer
Analyze all data and write final reports.

Total Project Cost/Duration

$323,000/30 months.

Research Organization

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