

# Electrochemical transfer of tramp element from molten iron

## Continuous Cu separation from molten Fe by molten oxide electrolysis

### Overview

Recycled smelting using steel scrap can significantly reduce carbon usage and CO<sub>2</sub> emission compared to current method, and it is an effective mean to reduce the actual increasing amount of steel scrap.

However, the contamination of tramp elements, such as Cu/Ni/Sn, which are difficult to remove by oxidation and evaporation, causes the property and workability deterioration of steel material. In addition, since tramp elements are concentrated each time the steel scrap is recycled, they become the cause of the inability to increase recycling rate. The conventional method of copper removal using sulfide flux has been considered, but this is a batch process using a large amount of sulfide.

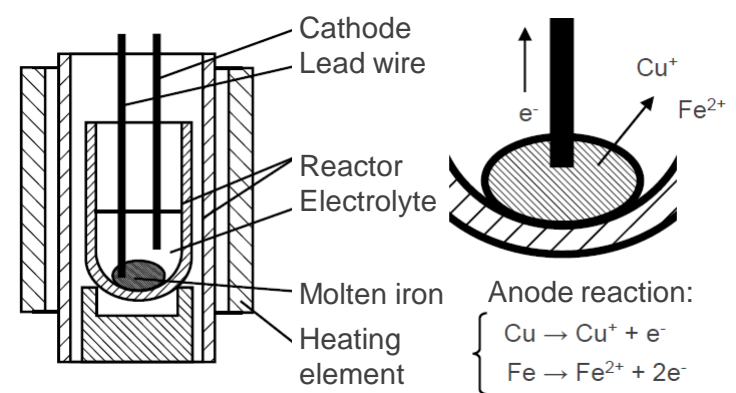
This invention is about a technology to promote ion separation of Cu in molten iron into molten slag using electrochemical method, which enables in principle continuous processing. Moreover, not only purification of molten iron but also recycling of recovered electrodeposited copper can be considered.

### Product Application

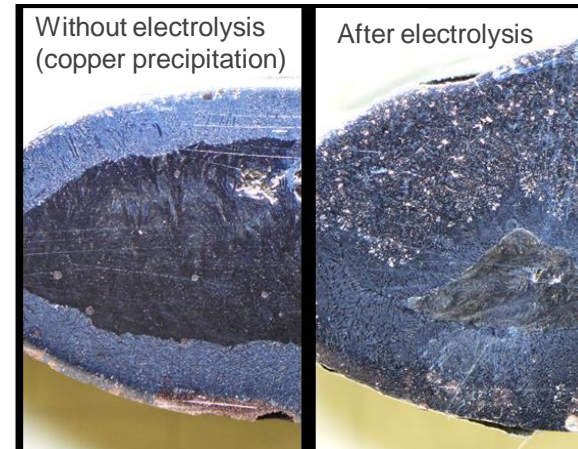
- Recycled smelting with steel scrap
- Continuous tramp elements removal

### IP Data

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 Admin No. : T20-1058



### Separation of Cu in molten iron



Transfer of Cu in molten iron due to electrolysis

- Electrocapillary phenomena
- Lorentz force

Cu-rich phase concentrated near the metal-slag interface via electrolysis may contribute preferentially to the anodic reaction.

Cross section of solidified carbon-saturated iron containing copper

### Related Works

- [1] Uchida, Y., Matsui, A., Kishimoto, Y., & Miki, Y. (2014). Removal of Copper from Molten Iron with Na<sub>2</sub>CO<sub>3</sub>-FeS Fluxes. *Tetsu-to-Hagané*, 100 (2014), 769-777.
- [2] S.H. Lee & D.J. Min. (2020). Effects of electrochemical potential on sulfur removal in the molten CaO-SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> system. *Sep. Purification Technol.*, 236 (2020), 116231

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