

# MAEDA LAB.

## [Recycling Process of Metal Scraps]

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### Anode Passivation during Electrorefining of Copper

#### Recycling of Copper from Waste Electro Devices

In a copper electrorefining process, crude copper (99%) is anodically dissolved into sulfuric acid electrolyte and electrolytic copper (99.99%) is deposited on the cathode. However, in certain situations, a phenomenon called anode passivation terminates the entire electrorefining process by forming deposit layers on the anode surface. In addition, the recent increase in the use of secondary materials (scraps) will inevitably increase the concentration of impurities in crude copper. Therefore, it is expected that using such anodes would result in a higher frequency of anode passivation. Given this background, we are currently investigating the passivation mechanism of the anode by employing in situ observation techniques with the ultimate goal of developing a new preventive method.

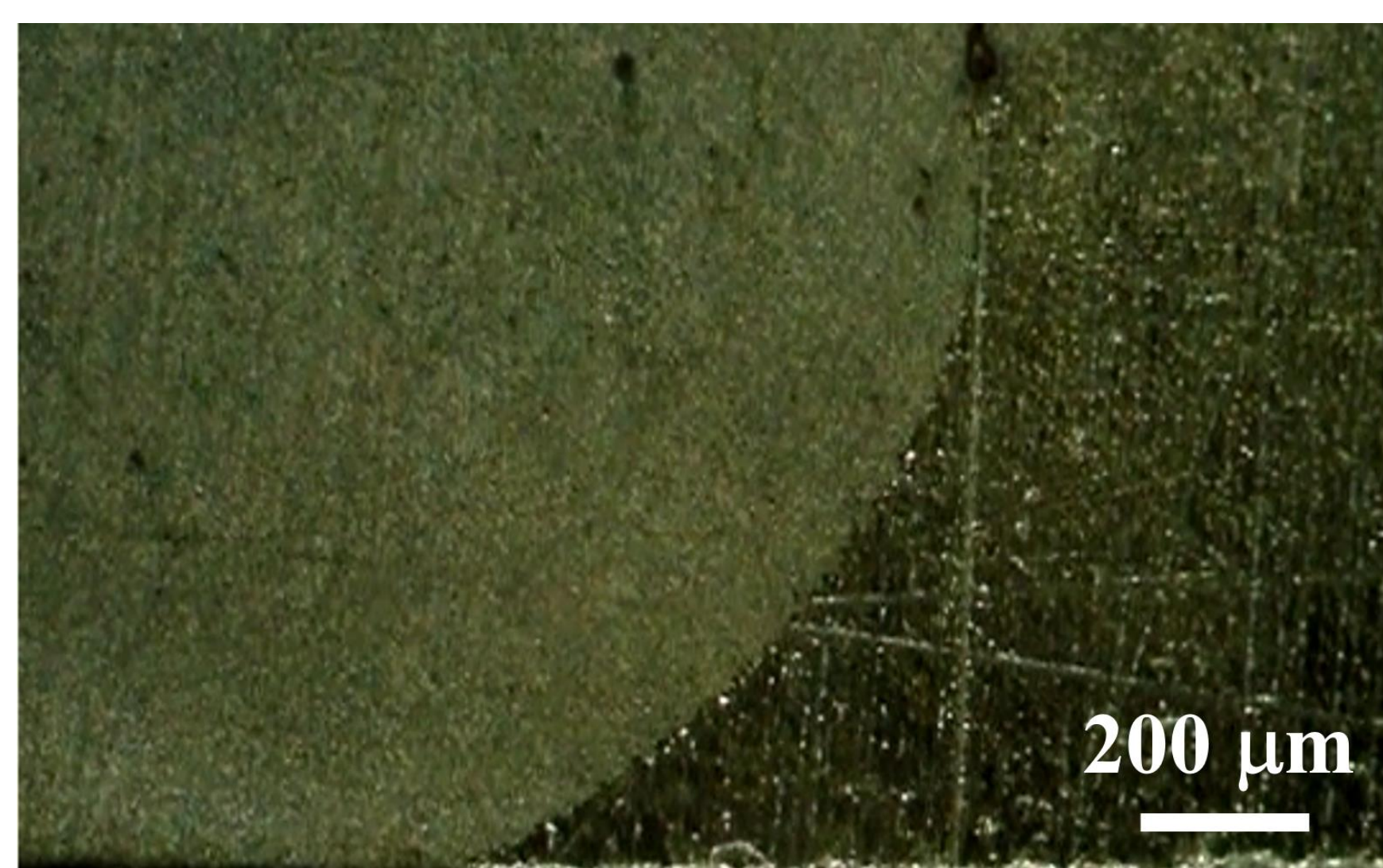


Figure Dissolving copper anode surface

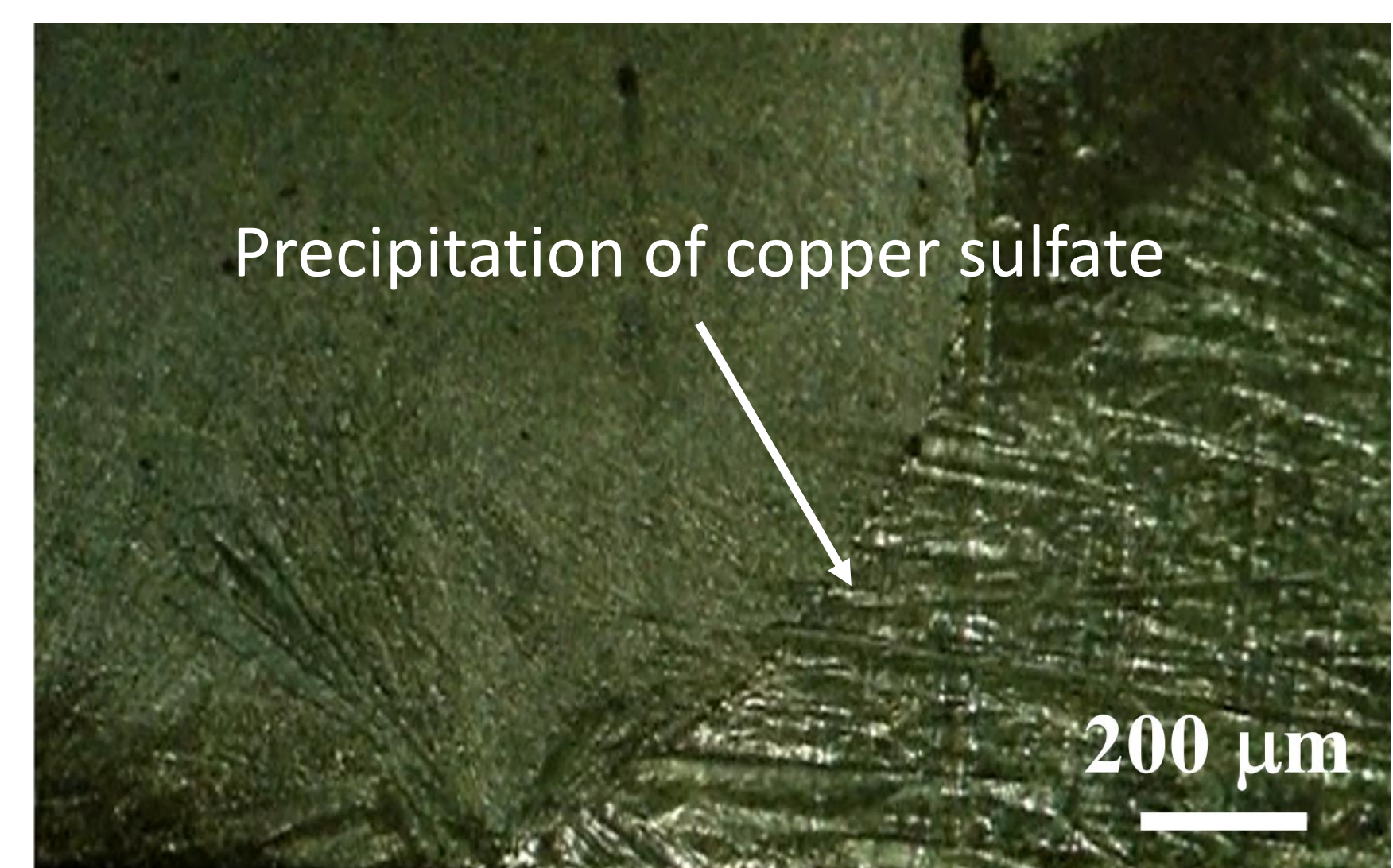
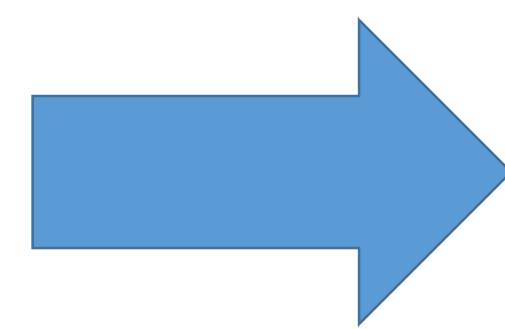


Figure Copper anode surface at the moment of passivation

### Precipitation Mechanism of Spheroidal Graphite in Cast Iron

#### Advanced Recycling Process of Ferrous Scraps

In general, cast iron can be classified as a group of Fe-C-Si alloys with carbon and silicon concentrations ranging from 2.1-6.7 mass% and 1.0-3.0 mass%, respectively. Carbon in cast iron precipitates in the form of graphite, and it is known that the physical and mechanical properties of castings are strongly dependent on the morphologies of graphite in the microstructure. The subject of our studies, which is ductile iron, is a type of cast iron with a spherical graphite morphology. The main purpose of our research focuses on the microstructure control of ductile iron. In addition, because using scraps as a raw material for cast iron is expected to increase steadily in the future, the effects of common tramp elements, such as Cu and Sn, on the precipitation behavior of graphite during solidification are also under investigation.

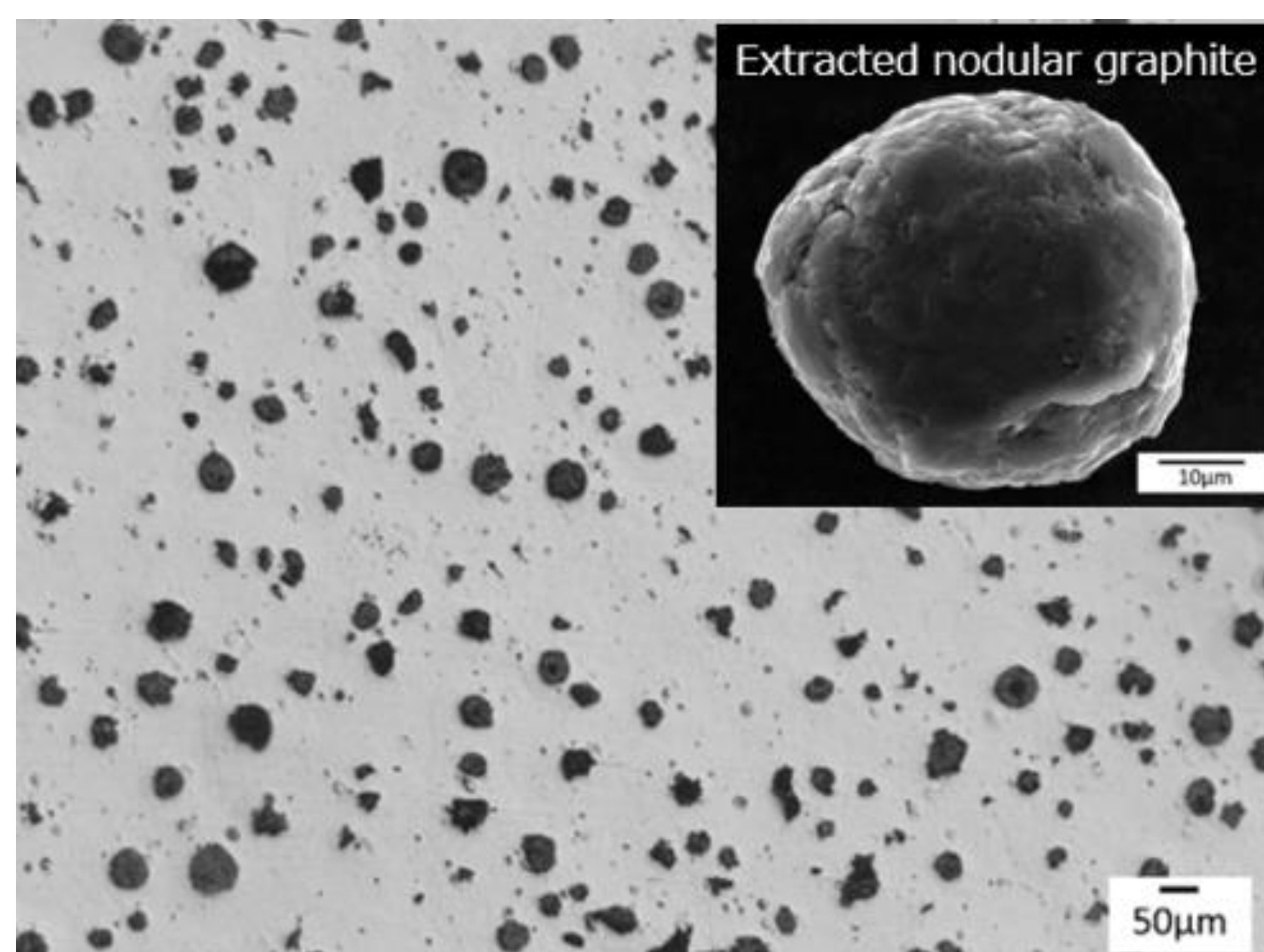


Figure SEM image of nodular graphite

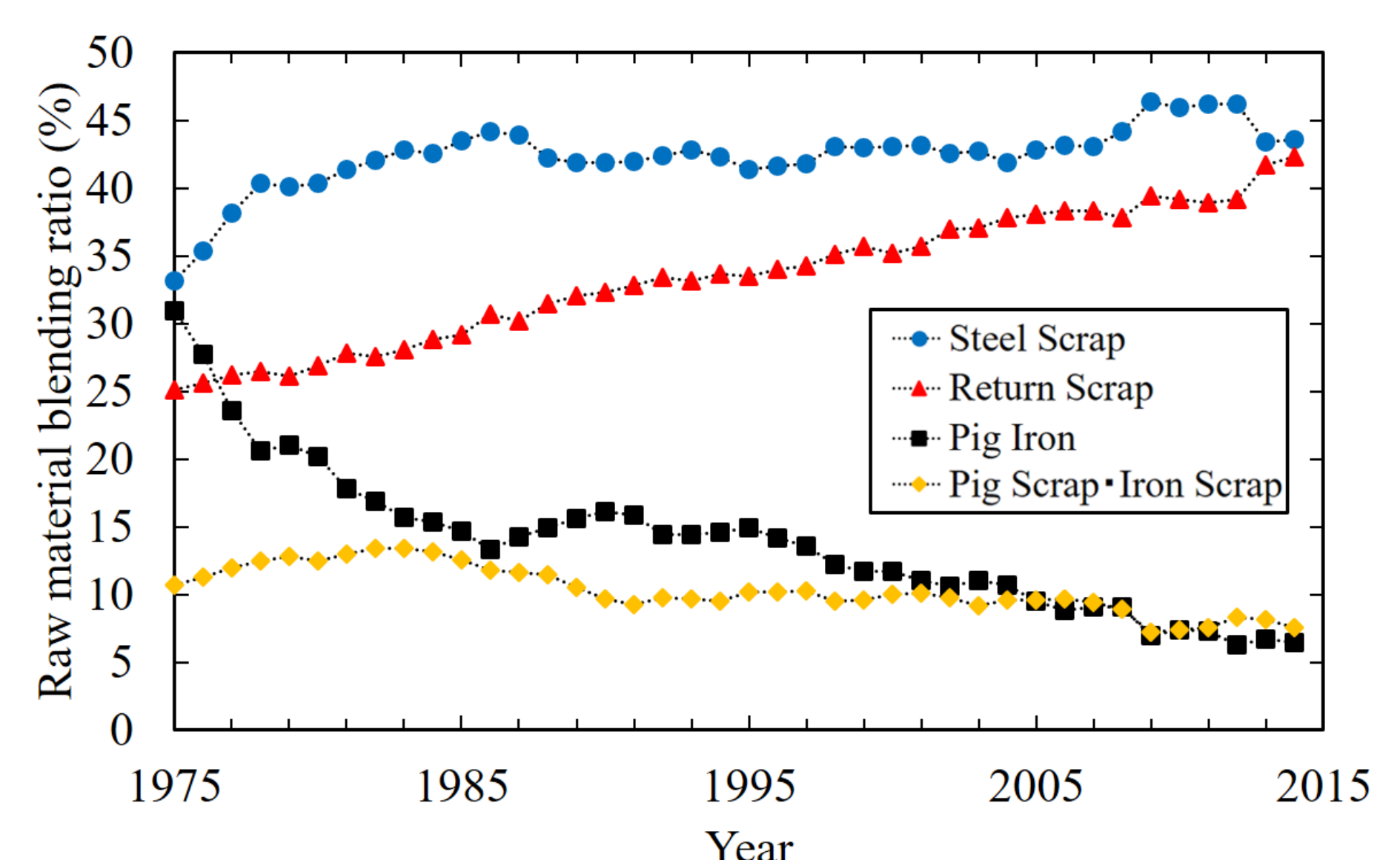


Figure Raw material blending ratio in cast iron production in Japan

Japan Iron and Steel Federation, Foundry related documents (鋳物用鉄関連資料), (2015).