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Removal of Iron Oxide Scale from Boiler Feed-water in Thermal Power Plant by Magnetic Separation -Aggregation States of Oxygenated Treatment Scale-

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1. Introduction

Iron oxide scale removal from boiler feed water was studied to suppress the deterioration of power generation efficiency of the thermal power plants adopting oxygenated treatment (OT), by using high gradient magnetic separation (HGMS). Since the magnetic susceptibility and secondary particle size of the target particles have large effects on the magnetic separation efficiency, we focused on the surface charges and the aggregation state of the scale particles. The objective of this study is to clarify the relation among pH, surface charge, particle aggregation and magnetic separation efficiency.

2. Experimental methods

The mixtures of ferromagnetic magnetite and paramagnetic hematite or goethite were respectively prepared as simulated scales, the capture target. The ratio of each mixture was based on that of the collected scale in low-pressure feed-water heater drain, where the system is planned to be introduced. The pH of each mixture was adjusted to change the surface charge, and then magnetic separation was conducted. After this, the weight and magnetic susceptibility of the particles were measured.

3. Results and discussions

Both the mixtures showed highest separation rate in neutral pH. This is due to heterogeneous aggregation caused by low surface charge. However, the separation ratio of goethite component in neutral pH was lower than other pH. This is considered to be due to the homogeneous aggregation of goethite by hydroxyl groups at neutral pH. The HGMS is to be installed in the feed-water system of thermal power plant or in the chemical cleaning line, which are respectively basic and acidic to neutral pH. Hence, it is necessary to construct magnetic separation system that is the most suitable for each condition.

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