

Analysis of precipitation process of calcium carbonate using electrolysis

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1. Introduction

High frequency electrolysis was used for reducing calcium contained in underground water or the factory drainage as making calcium carbonate around the electrodes.

With calcium, a carbonic acid ion and carbon dioxide in the air is absorbed in this process and this electrolysis has possibility to work for the reducing of the carbon dioxide in the air.

In this test, we measured ORP (redox potential), pH, EC, Ca and HCO₃ during the scaling the calcium carbonate around electrodes, and analyze the adhesion mechanism.

2. Device and the outline of the examination

DYNAKLEEN 150T by REIKEN Inc. was used for the experiment.

This device consisted of control parts and electrode departments (three electrodes and electrode cover), and collection did calcium carbonate with the electrode cover installed with preventing calcium carbonate from sticking to the electrode itself by making the anode of these three electrodes and the cathode change periodically in about the electrode.

A sample solution made a calcium lactate dissolve in the distilled water, and it was made so that Ca concentration might become 200ppm.

Moreover, sodium bicarbonate was mixed, and carbonic acid ion concentration of the solution was adjusted.

3. Result

At test start, ORP decrease rapidly, and reach 0 at 20 minutes from start, and become the states of reduction which reach -250 in about 3 hours.

And, pH and electrical conductivity began to change, too, and a bubble occurred, and Ca, HCO₃ concentration began a decrease from around the electrode.

As a result that a solution becomes a state of reduction, a response with Ca and HCO₃ occurred, a calcium carbonate scale precipitate in this.

It can be observed that a white scale sticks to the electrode cover in about several hours.

After that, ORP value is rising and it becomes the condition to become 0 about 30 hours.

It almost becomes equilibrium value after 30 hours from start, pH decreases to 5.3, EC to 70mS/m, HCO₃ to 10ppm and Ca to 80ppm.

By the way, when sodium bicarbonate wasn't used, pH was rapid right after the energizing start carbonic acid ion concentration.

The absorption of carbon dioxide in the air can be thought carbonic acid ion concentration to increase as a result. And calcium ion reacted with carbonic acid ion which contains that absorbed carbon dioxide and scaling as the calcium carbonate.