

Maeda LAB.

[Thermodynamics and recycling of critical metals]

International Research Center for Sustainable Materials

<http://maedam.iis.u-tokyo.ac.jp>

Resource recovery and waste technology

Department of Materials Engineering

Purification of silicon for solar cells

Production of high purity silicon
Starting material: (SiO_2)

↓ Reduction

Metallurgical-grade Si containing impurities

↓ Chlorination, distillation and reduction

Solar-grade Si (99.9999%)

↓

Semiconductor (99.99999999%)

Evaporation of impurities (P, B) by electron beam melting

Scrap silicon (Metallurgical grade)

↓

Electron beam

B P

Melting

↓

Purified Si (100 kg)

Electron beam melting apparatus

Lower cost process is required

Thermodynamic measurement of alloys and compounds

Thermodynamic information is needed to develop processes to recover metals.
→ Measurement of reaction energies.

Ore or scraps

Rare metals, Valuable elements

Double Knudsen mass spectrometry

Samples

- ① Fe-Nd alloy (Aiming at recovery of rare-earth from Fe-Nd-B magnets)
- ② Slag used in iron-making
- ③ P, B as dopant in Si

Gas molecules are detected separately for each mass

Knudsen cell

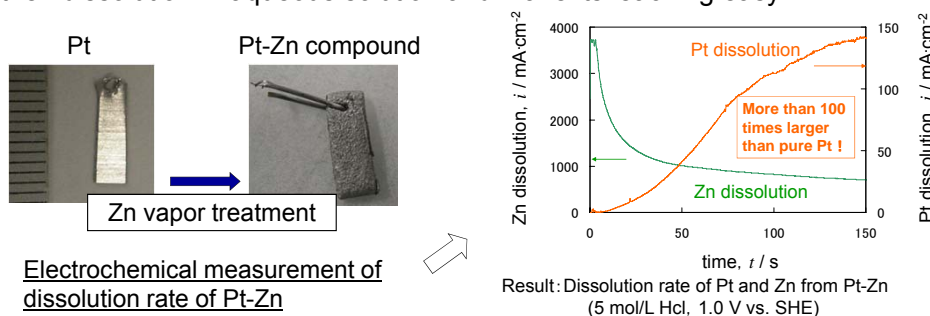
Fe-Nd

Several samples are studied in rotation

Apparatus for double Knudsen mass spectrometry

Recovery process of metals

We are developing processes to recover metals used in industrial products. For platinum group metals, zinc vapor pretreatment is proposed to enhance their dissolution in aqueous solution and make its leaching easy



- Members**
- Professor Masafumi Maeda
 - Research associate Takashi Nagai
 - Technical associate Hisao Kimura
 - Project research associate Hideaki Sasaki
 - Researcher Takahiko Okura
 - Doctoral course student Tsuyoshi Kiriya (D1)