

# MAEDA LAB.

## [Recycling of Precious Metals, Refinement of Molten Silicon, and Drying of Lignite Using Superheated Steam]

International Research Center for Sustainable Materials

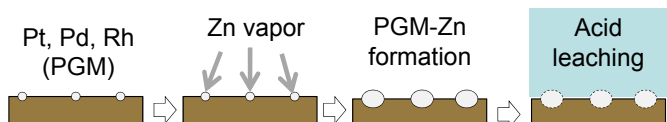
<http://maedam.iis.u-tokyo.ac.jp>

### Recovery and Waste Technology

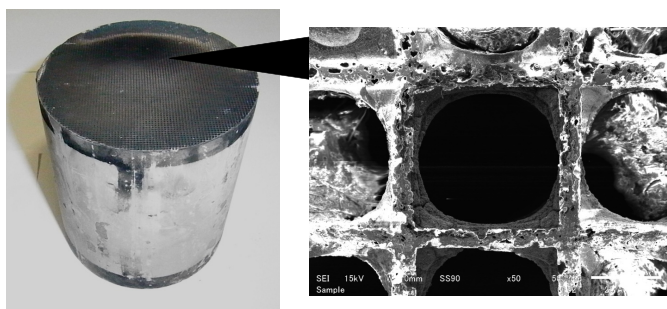
Department of Materials Engineering

### Recycling of Precious Metals

Precious metals such as Pt, Pd and Rh are used in automotive catalysts. To recover them with a smaller environmental load and at lower cost requires the development of a new process. In our process, precious metals are exposed to Zn vapor before acid leaching to enhance their dissolution.



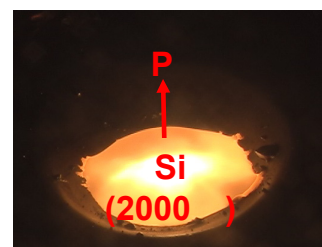
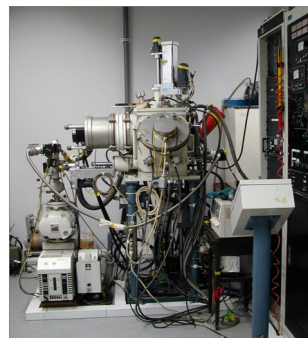
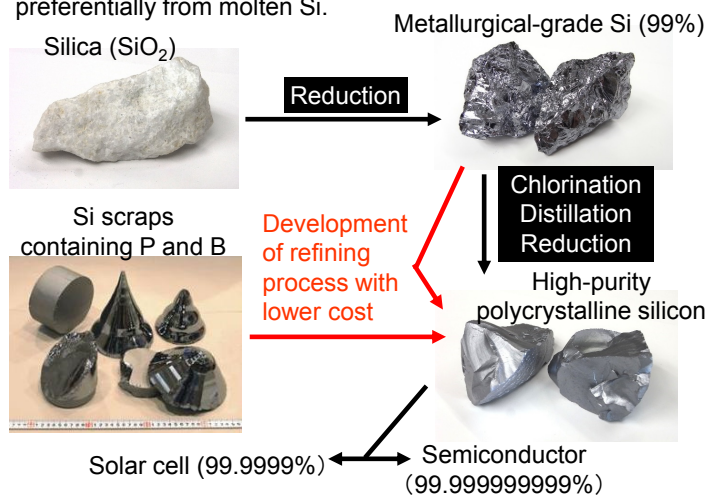
Proposed recovery process for precious metals



Spent catalyst (PGM particles are dispersed in the coating layer on substrate with a honeycomb structure)

### Refinement of Molten Silicon

Solar-grade Si requires a purity of 99.9999%. Conventional refining processes for Si involve a large environmental load and high cost. We are developing a refining process using electron beams. Melted in a vacuum, some impurities evaporate preferentially from molten Si.



(↑) Si melted with electron beam  
(←) Electron beam melting apparatus

### Drying of Lignite Using Superheated Steam

Lignite is a low-rank coal containing a great deal of moisture and accounts for 23% of the proven recoverable reserves of all coal. Because of the difficulty of transportation, it is used mainly as a fuel in thermal power stations located near source mines. With the increasing demand for energy, however, the use of low-rank coal is becoming important. We are studying drying the characteristics of Loy Yang coal in superheated steam.

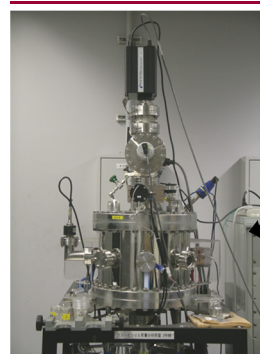


Open-pit mining of Loy Yang coal and thermal power station

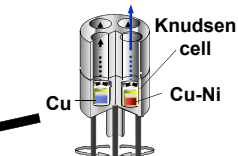


Loy Yang coal

### Thermodynamic measurement and reaction analysis



Evaporated species are detected for each molecular mass



By rotating the cell holder, multiple samples can be measured sequentially under identical conditions

Double Knudsen cell mass spectrometry

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