Sumitomo Metal Mining Co., Ltd.

Establishment of Scandium Recovery Business

Sumitomo Metal Mining Co., Ltd. (SMM) has taken a decision to establish operations for recovery of scandium, a rare earth element, at its nickel plant and has concluded a long-term sales agreement of scandium oxide with a major US-based fuel cell manufacturer.

SMM constructed a pilot plant at its subsidiary Coral Bay Nickel Corporation (Palawan Island, the Philippines) in 2013, and has developed technology for commercial-scale scandium recovery from the nickel and cobalt mixed sulfides manufacturing process. The successful test result has lead SMM to decide to construct a plant for the recovery of an intermediate product for scandium oxide at its subsidiary Taganito HPAL Nickel Corporation (THPAL, Mindanao Island, the Philippines). Processing of this intermediate product into the final product (scandium oxide) shall be performed at SMM's Harima Refinery.

Scandium is a rare earth element for which it is estimated that current annual production stands at 10 to 15 tonnes (scandium oxide equivalent) globally, mainly in countries such as China and Russia, and its use has arguably been limited due to small production volume.

SMM believes that this new, stable and long term Western supply of scandium oxide from outside the current main producers' countries will help boost demand from current fuel cell users and potential scandium consumers.

In support of global commitments for making energy use more efficient and combatting climate change, SMM will be able to contribute to expansion of fuel cell systems, which reduce CO₂ emissions from electric power generation dramatically.

The development of a stable source of scandium is projected to enable the use of scandium oxide in new materials across a range of fields. SMM will make efforts to expand the range of uses for scandium and develop the market along with potential customers.

SMM shall continue to advance its efficient recovery of resources and increase

the added value of HPAL (high pressure acid leach) technology, thus further improve the company's competitiveness in the global nickel business.

Overview of scandium recovery commercialization

- 1) Investment: ¥4 billion approx.
- 2)Production capacity:7.5tonnes per year approx. (scandium oxide equivalent)
- 3) Production bases:

THPAL (pre-processing)

Produces intermediate product for scandium oxide .

SMM Harima Refinery (post-processing)

Produces scandium oxide from the intermediate product.

4) Start of production: Spring 2018 (planned)

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Reference 1: Overview of THPAL

- 1) Name: Taganito HPAL Nickel Corporation
- 2) Capital relationship: SMM 62.5%, Nickel Asia Corporation 22.5%, Mitsui & Co.,Ltd. 15.0%
- 3) Location: Taganito, Surigao del Norte province, the Philippines
- 4) Employees: 550 approx.
- 5) Products:

Nickel and cobalt mixed sulfides.

6) Production volume (per annum): Nickel metal equivalent: 30,000 tonnes (approx.), cobalt metal equivalent: 2,600 tonnes (approx.).

Reference 2: Potential usages of scandium See attached materials

Potential of Sc

Al-Sc master alloy (scandium: 2%)



Pure aluminum



Scandium oxide



Fuel cells

- ✓ Used in electrolytes/anodes
- ✓ High efficiency
 - (high ion conductivity)
- ✓ Long Life

(low operation temperature)

Aluminum/Scandium alloys (Scandium: 0.1 - 0.5%)

- Aircraft and Aerospace
- / Automobile
- ✓ Luxury sporting goods

Emerging applications

- **LED**
- **Laser**
- / Electronics device
- Additive for structural metal
- Novel refining process

Scandium and rare earths

