TUESDAY, AUGUST 24, 2004, A.M.

SESSION 24: FIFTH INTERNATIONAL SYMPOSIUM ON WASTE PROCESSING AND RECYCLING IN MINERAL AND METALLURGICAL INDUSTRIES

ENVIRONMENTAL ASPECTS
Sponsors: Hydrometallurgy, Non-Ferrous Pyrometallurgy, Iron and Steel Sections and Environment Committee of the Metallurgical Society of CIM and the Environmental Society of CIM
Room: Chedoke B
Chairmen: L.M. AMARATUNGA, Laurentian University, Sudbury, Ontario, Canada, and I. HORNE, SRK Consulting, Toronto, Ontario, Canada

PAPER 24.1 — 9:00 (KEYNOTE)
REMEDIATION OF HAZARDOUS INDUSTRIAL WASTES.
J.A. KOZINSKI, McGill University, Montréal, Québec, Canada

Waste remediation is a goal that will be driven forward by economic conditions. As the cost of waste disposal increases, new methods of waste reduction will become economically attractive, and will be implemented. It is difficult to imagine, however, a time when there will be no waste generation. For the foreseeable future, despite effective reduction practices, there will still be hundreds of millions of tons of waste that must be destroyed or controlled to protect the public health and the sanctity of the environment. To remain faithful to environmental covenants, the mineral and metallurgical industries will face these new challenges. This paper discusses novel waste remediation approaches and techniques focusing on hazardous wastes. Aspects concerning technological and environmental importance are examined. Solutions for neutralization of environmentally hazardous compounds are proposed.

PAPER 24.2 — 9:50
PROTECTION AGAINST FLUORINE DISSOLUTION AND pH CHANGE OF SEAWATER DURING STEELMAKING SLAG ADDITION.
T. MIKI, M. HINO, Y. SAMADA, Graduate School of Engineering, Tohoku University, Sendai, Japan and K. SHITOGIDEN, Nippon Yakin Kogyo Corp., Japan

Steelmaking slag contains nutrition such as Si, P and Fe for acceleration of phytoplankton growth. Phytoplankton can fixate carbon dioxide more than any others on the earth. Hence, suppression of CO_2 can be achieved by educing the potential of steelmaking slag as the nutrition for their propagation. When it is considered to supply nutrition from steelmaking slag to seawater, we must avoid dissolution of hazardous elements or change of pH of seawater by steelmaking slag addition into seawater. The protection against dissolution of fluorine into artificial seawater has been studied based on dissolution behavior of steelmaking slag and synthesized substances into artificial seawater in the present work. The dissolution mechanism of fluorine from steelmaking slag and buffering action of pH change are discussed by using stability diagram in seawater.

COFFEE BREAK — 10:15 – 10:40

PAPER 24.3 — 10:40
SIMULTANEOUS REMEDIATION OF WATER AND SEDIMENT QUALITIES IN CULTURALLY OLIGOTROPHIC COSTAL ENVIRONMENTS USING STEELMAKING SLAG.
T. YAMAMOTO, Hiroshima University, Higashi-Hiroshima, Japan

In semi-enclosed coastal areas in Japan, phosphate is often observed to be the level that may limits phytoplankton growth, causing alteration of species composition from diatom-dominated to nuisance dinoflagellate-dominated community. The sediment quality is still degraded showing reduced conditions with rich organic substances. This is the major cause of oxygen-depleted bottom water formed in summer, and it makes benthos difficult to survive. Steel-making slag can be a source of phosphate and silicate which induce growth of both planktonic and benthic diatoms. Diatoms will make coastal ecosystems healthy by recovering the efficient classical food chain. Further, steel-making slag may remediate the reduced condition of sediments through the formation of iron hydroxide that works as a kind of oxygen pool in addition to oxygen production by the photosynthesis of benthic diatoms.

PAPER 24.4 — 11:05
AVAILABILITY OF STEELMAKING SLAG AS A NUTRIENT SOURCE FOR MARINE PHYTOPLANKTON GROWTH.
A. TANIGUCHI, Y. NAKAMURA, K. ARITA, Y. MASUDA, Tohoku University, Sendai, Japan and K. Haraguchi, Core Laboratory, Mie, Japan

Availability of steelmaking slag for various marine phytoplankters including purely cultured strains and natural populations was tested in land and shipboard laboratories. Effect of slag addition on free-living bacteria, which is an important agent of material cycle in the marine ecosystems was also determined. The results obtained demonstrate that, although their solubility was not uniform among different slags, dissolved iron, silicate, phosphate originating from the slag stimulate phytoplankton growth. No negative effect on bacteria was observed at lower dose, e.g. less than 200 mg/l. Therefore, the slag can be an appropriate source of nutrients for marine phytoplankton unless added at excessively higher concentrations. In so-called HNLC (high-nutrient low-chlorophyll) oceanic areas such as the Southern Ocean and the subarctic North Pacific, where iron is almost only limiting factor of the phytoplankton growth, slag would be an ideal source of iron and enhance CO_2 fixation by phytoplankton photosynthesis.

PAPER 24.5 — 11:30

ENHANCEMENT OF PHOTOSYNTHETIC CO_2 FIXATION BY MARINE PHYTOPLANKTON WITH STEELMAKING SLAGS AS A NUTRIENT SOURCE

M. HINO, T. MIKI, T. NAGASAKA, Tohoku University, Sendai, Japan

Suppression of CO_2 and waste such as slags discharged from iron- and steelmaking processes are some of the typical biggest issues for the protection of global environment and sustainable growth of steelmaking industry. Utilization of active phytoplankton growth will be one of the best options to stabilize and suppress carbon dioxide at high-efficiency. Inorganic minerals such as C, O, N, Si, P and Fe are necessary for phytoplankton multiplication. It is crucial for supply of nutrition into seawater effectively for phytoplankton multiplication to understand the dissolution behavior of some elements from steelmaking slags into seawater. The morphology of the precipitated phases in steelmaking slags during cooling period was investigated in the present work. The dissolution behavior of some elements from steelmaking slags into artificial seawater has also been studied