

TUESDAY, AUGUST 24, 2004, A.M.

SESSION 23: FIFTH INTERNATIONAL SYMPOSIUM ON WASTE PROCESSING AND RECYCLING IN MINERAL AND METALLURGICAL INDUSTRIES

METAL RECYCLING

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 A

Chairmen: G. RICHARDS, Teck Cominco, Trail, British Columbia, Canada, and P. BARR, University of British Columbia, Vancouver, British Columbia, Canada

PAPER 23.1 — 8:30

METAL RECYCLING AND WASTE TREATMENT IN JAPAN

M. MAEDA, University of Tokyo, Tokyo, Japan

Metal recycling and waste treatment have become common issues in various metal industries, notably, the iron and steelmaking industry and the nonferrous industry. The former tends to treat mass wastes such as municipal wastes or plastics. However, volatile compounds are condensed in dusts of their incineration processes and they should also be treated, likely by the nonferrous industry. Those “end-of-life” products contain heavy metals that might be harmful to mankind and should be handled by the non-ferrous industry. Not only revenue derived from regeneration of metals from the secondary materials but also the revenue generated from the treatment charges is a strong attraction for nonferrous industry to process secondary materials. The present study presents some statistical data of the Japanese corporations in the iron and steelmaking industry as well as the nonferrous industry on their revenues generated from processing of secondary materials. Some of the companies are now concentrating their business resources on new areas of the market. Although the quantity of waste or recyclable material is still small at present, the quantity will increase in the near future, and it is anticipated that international collaboration is required to handle the greater variety and the larger quantity of secondary materials.

PAPER 23.2 — 9:25

INVESTIGATIONS ON CAR MOTOR SCRAP RECYCLING PROCESS IN A STEEL WORK.

T. NAKAMURA, Tohoku University, Sendai, Japan,

T. TAKASU and H. ITO, Kyushu Institute of Technology, Kitakyushu, Japan

Small car motor scrap recycling process was proposed using waste pickling acid in a steel work. A part of steel in motor scrap was leached by waste pickling acid (Fe^{3+} - Fe^{2+} - H_2SO_4 solution) and Cu wire is recovered. High grade FeSO_4 agent could be produced from the leaching solution.

PAPER 23.3 — 9:50

METAL VAPOR TREATMENT FOR PLATINUM GROUP METALS FROM SPENT AUTOMOTIVE CATALYST.

Y. KAYANUMA, T.H. OKABE, Y. MITSUDA, M. MIYAKE and M. MAEDA, University of Tokyo, Tokyo, Japan

A new process to recover platinum group metals (PGMs) from automotive catalyst scrap using metal vapor was developed. To improve the efficiency of the acid dissolution process of PGMs, metal vapor of reactive elements such as magnesium or calcium were contacted with spent automotive catalyst. It was expected that metal vapor would react with metal selectively and form intermetallic compounds. The specimen of the spent catalyst was treated at 1173 K for 3 h, and it was then dissolved in aqua regia for 1 h to recover PGMs. After the reactive metal treatment, 88% of Pt, 81% of Pd, and 72% of Rh in the catalyst scrap was dissolved, while only 77% of Pt, 69% of Pd, and 38% of Rh was dissolved from untreated scraps.

PAPER 23.4 — 10:40

RECOVERY OF METALS FROM METAL MIXTURES BY ALKALINE LEACHING.

M. MIYAKE, Y. MITSUDA and M. MAEDA, University of Tokyo, Japan

A leaching treatment was investigated to recover metals including rare earths from the mixtures of hydrogen storage alloys and nickel hydroxide. A potential-pH diagram of the La-Ni- H_2O system including the domain of stability of LaNi_5 was drawn to find appropriate leaching conditions. Alkaline solutions containing ligands that form complexes with nickel ions were supposed to be available to separate hydrogen storage alloys from the mixture. When the mixture was leached with ammoniacal alkaline aqueous solutions, the nickel hydroxide was dissolved and the hydrogen storage alloy was recovered as its original alloy.

COFFEE BREAK — 10:15 – 10:40

PAPER 23.5 — 11:05

RECYCLING OF NON-FERROUS METALS AT HYDROMÉTAL, BELGIUM.

N. VERBAAN, Hydrometal SA, Engis, Belgium, and

P. HENRY, Jean Goldschmidt International SA, Brussels, Belgium

Three case studies at an integrated hydrometallurgical recycling facility (Hydrométal) in Belgium are discussed. Hydrometallurgy provides an adequate technology to reintroduce otherwise lost metal units into the industrial cycle, thereby saving resources and energy, while keeping the environment cleaner. (I) Non-ferrous leach residues are treated by a leach-SX process to recover its minor metals (Ge) contents. Its remaining iron waste solution is used by the fertilizer industry nearby. (II) Residual low quality acid and caustic are used in the processing of zinc industry cements to produce separate copper, cobalt and zinc concentrates by several consecutive selective leach - precipitation processes. (III) Copper anode slimes are treated and its precious metal contents are recovered. Depending on the composition of the slimes, separate or combined concentrates of copper, bismuth and tellurium/selenium can be produced

PAPER 23.6 — 11:30

ENERGY SAVING GREEN TECHNOLOGY FOR COPPER RECYCLING FROM ELECTRONIC SCRAP.

M.S. ALAM, M. TANAKA and K. KOYAMA, National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Ibaraki, Japan, and

J.-C. LEE, Korea Institute of Geoscience and Resources (KIGAM), Daejeon, Korea

Extensive research work is being carried out at AIST for developing energy saving green technology for base and precious metals recovery. In the present work, a new flowsheet is developed for copper recycling from waste electronic circuit board where copper was recovered by leaching followed by solution purification and direct electrowinning of Cu(I) from ammoniacal alkaline solution. In this new technology, power consumption in EW circuit was greatly reduced. This paper describes the overall process with an emphasis on different aspects of solution purification where impurities were selectively removed by cementation and solvent extraction techniques under nitrogen atmosphere.