WEDNESDAY, AUGUST 25, 2004, A.M.

SESSION 43: INTERNATIONAL SYMPOSIUM ON LIGHT METALS AND METAL MATRIX COMPOSITES

MAGNESIUM TECHNOLOGY II
Sponsor: Light Metals Section, The Metallurgical Society of CIM
Room: 203
Chairmen: A. FAUCHER, Norsk-Hydro, Bécancour, Québec, Canada, and
M. PEKGULERYUZ, McGill University, Montreal, Quebec, Canada

PAPER 43.1 — 8:30
BEHAVIOUR OF MAGNESIUM HYDROXYLCHLORIDES IN FUSED SALT ELECTROLYTE
M. KREUH, S. KASHANI-NEJAD and K.-W. NG, McGill University, Montréal, Québec, Canada

Crystalline Mg(OH)Cl and amorphous $Mg_2(OH)_3Cl$ were successfully isolated from a hydrolyzed molten salt electrolyte sample in this work. It was found that the chemical form and crystallinity of the hydroxylchloride were controlled by the cooling rate of the molten sample when it was taken. Crystalline Mg(OH)Cl could only be obtained by cooling the molten electrolyte sample at a rate not faster than 0.6 ^oC/min. Upon more rapid cooling, the hydroxylchloride species precipitated as $Mg_2(OH)_3Cl$. The behavior of these solid hydroxylchlorides when contacted with fresh and non-hydrolyzed molten electrolyte at 550^oC was also examined. It was found that the Mg(OH)Cl rapidly dissolved in the hot electrolyte and did not decompose into MgO at that temperature as would be expected from the literature. The dissolution rate of solid $Mg_2(OH)_3Cl$ was found to be so slow by comparison that it resulted in the complete decomposition into MgO which thereafter was incorporated into the electrolyte as a suspended solid phase rather than dissolution.

PAPER 43.2 — 8:55
CORROSION PROPERTIES OF SKIN AND BULK OF SEMI-SOLID PROCESSED AND HIGH PRESSURE DIE CAST AZ91 AND AZ91CA ALLOYS.
C. BLAWERT, V. HEITMANN and E. MORALES Center for Magnesium Technology, GKSS Research Center, Geesthacht, Germany

Recently we have studied the corrosion properties of two Mg-Zn-RE alloys produced by standard squeeze casting and thixo-casting technique. Surprisingly, the bulk corrosion properties were much better than the skin properties. This is contradictory to the generally accepted finding that a finer microstructure of the skin leads to a better corrosion performance. Thus the aim of the present study is to examine some more standard alloys (AZ91) and processes (HP die casting) regarding the corrosion performance of the skin. The corrosion properties of the skin and the bulk were studied in 5% NaCl solution by (a) analysing the corrosion morphology, (b) measuring electrochemical polarization curves and (c) immersion tests at constant pH-Value. Additional information was obtained by locally resolved SRET and EC-Pen measurements. By using LM, SEM and EDX to evaluate the microstructure of skin and bulk specimens before and after the corrosion measurements, the corrosion results will be related to the microstructures of the specific alloys and the influence of the skin will be discussed.

PAPER 43.3 — 9:20
FATIGUE CRACK PROPAGATION IN MAGNESIUM SINGLE CRYSTALS.
S. ANDO, M. TSUSHIDA and H. TONDA, Kumamoto University, Kumamoto, Japan

The fatigue crack growth behavior of magnesium single crystal has been investigated. CT (compact tension) type specimens with different notch orientations were prepared. In the case of notch plane and direction are (1210) and [1010], fatigue crack propagates parallel to notch. From TEM observation, it is found that pyramial slips occur at the crack tip. When notch is normal to basal plane, a fatigue crack propagates [0001] and parallel to basal plane depending on stress intensity factor range. In the case of notch parallel to basal plane, a fatigue crack propagates through straight route with some {1012} twin. Fatigue crack growth rate, da/dN of A- and B- specimen is lower than F-specimen with crack parallel to basal plane.

PAPER 43.4 — 9:45
MEASUREMENT OF INERT GRAPHITE ANODE WEAR USING CONFOCAL SURFACE PROFILOMETRY.
J.B. RUBENSTEIN and B.R. DAVIS, Queen's University, Kingston, Ontario, Canada

This work demonstrates the feasibility of using confocal surface profilometry to measure and characterize wear of inert graphite anode surfaces. This measurement system has a fine resolution and a low detection limit. Contour maps, which are effective at displaying non-uniform wear, and total graphite consumption values can be generated from the

collected surface coordinates. This method was tested using anode samples that were electrolyzed for 24 hours in a laboratory magnesium cell with a high oxide (~3000 ppm) molten salt electrolyte. The oxide content produces accelerated wear on anodes designed for low oxide electrolytes.

COFFEE BREAK — 10:10 - 10:40