Gd
Eu Tb
Sm Dy
Pm Ho
RARVS
Nd Er
Pr Tm ®
Ce Yb
La Sc Y Lu

Rare-earth Information Center INSIGHT

Ames Laboratory
Institute for Physical Research and Technology
Iowa State University / Ames, Iowa 50011-3020 / U.S.A.

Volume 8 | May 1, 1995 | No. 5

Megon to Restart RE Production

Megon, which has over 25 years of experience in the rare earth field, had stopped its production of high purity yttrium and scandium oxides three years ago, but continued to trade various rare earth oxides and concentrates in special niche markets. In early April, Megon announced that it will start the production of rare earth concentrates next year, utilizing its parent company's (Norsk Hydro) feedstock from their fertilizer production from apatite ores. A new cost-efficient process was developed for manufacturing the rare earth concentrate in the form of a nitrate solution. The facility is located in Glomfjord, North Norway, and has an annual capacity of 1,300 tons of rare earth oxide equivalent.

Extratec AS, another fully owned Hydro company, has been merged with Megon. Extratec specializes in extraction technology and rare earth processing. This merger will consolidate and strengthen the rare earth activities in Norsk Hydro. This merger became effective on April 1, 1995 and the new company will be known as Hydro Megon AE. New appointments include Andreas Rygg as Managing Director, Gunnar Norum as Marketing Director and Morten Røsæg as Technical Director.

Cement

A report from the latest issue of **China Rare Earth Information (CRE Information)** (No. 36, February 1995) indicates that the addition of rare earths to cement may be an important (and potentially large) market for the rare earths. Chinese researchers at Huanan [*sic*] University found that the addition of small amounts (0.02 to 0.05%) to the raw materials in the production of cement reduces the calcination temperature and also increases the quality of the finished product. The reduction of the calcining temperature can lead to energy savings and reduced costs. The various rare earth oxides exhibit different degrees of effectiveness, but La_2O_3 seemed to be the best in a cement which utilizes clay or dry shale waste as the raw material. However, it is much cheaper to add the mixed light rare earths, than La_2O_3. The final product contains 0.002 to 0.008% rare earth, indicating that ~90% of the rare earth oxide is lost in the process of making cement. **CRE Information** reported that several cement producers have started to use the rare earths.

Ultrafine AlN Particles from Al-Y Alloys

Hexagonal aluminum nitride, AlN, is a hard ceramic material with a high thermal conductivity, excellent stability and luminescence. Because of these outstanding properties, it is used as a substrate for removing heat from semiconducting devices, and also as coatings, high-strength materials and crucibles for melting metallic alloys. Ultrafine particles of AlN are produced by melting Al in a nitrogen plasma atmosphere, but unfortunately, a mixture of fine particles of AlN

- more -

Telephone: (515) 294-2272
Facsimile: (515) 294-3709
Telex: 269266
Internet: RIC@AMESLAB.GOV

and Al are produced. The amount of Al particles can be reduced, but not eliminated, by mixing NH_3 or H_2 gas with the N_2 in the plasma. The presence of Al greatly degrades the performance of AlN. Yamaguchi, *et al.* [**Mater. Trans. JIM 35**, 538 (1994)] from the Institute for Materials Research, Sendai, Japan recently reported that by using molten Al-Y alloys instead of the unalloyed Al, there is a remarkable increase in the production rate from ~30% to ~90% of the AlN particles, and also there are no Al particles in the final product. The best yields were obtained from a 50:50 Y-Al alloy using a N_2 + 4% H_2 gas at a pressure of 40 kPa. The AlN particles were in the shape of cylinders ~200 nm long and ~50 nm in diameter. The presence of YN particles, about 5 nm in diameter, were often observed in the AlN product. At this stage it is not known whether the presence of YN is an advantage, or if it has deleterious effects, or if it is neutral in its behavior. Furthermore, the Y addition to the molten Al alloy changes the morphology of the particles from a hexagonal plate when pure Al was used to a hexagonal prism for the $Al_{0.5}Y_{0.5}$ alloy. These promising results may open the door for the use of rare earths, especially Y, in the commercial production of ultrafine AlN powders.

Alloy News from Japan

Recent news coming out of Japan indicates that rare earth alloy additions have improved the properties of a number of metallic alloys — setting new records according to the manufacturer.

The use of ~0.5% Y_2O_3 to a steel containing 13-16% chromium, and 1 to 3% aluminum has yielded a steel with the highest known Young's (elastic) modulus which is close to the theoretical limit. Furthermore, this value of 29,000 kgf/mm^2 is about 40% larger than the previously reported maximum value. The new steel was developed by Sumitomo Metal Industries, Ltd., Osaka. It is prepared by ball-milling the four component materials, then alloying by a heat extrusion process, and followed by a recrystallization step to obtain a (111) crystal orientation. {**Jap. New Mater. Rept. 9** [6] 1 (Nov.-Dec. 1944)}

The second development reported jointly by Mitsui Mining Company, Ltd. (Tokyo) and Nagaoka University of Technology, claims to have developed the strongest heat resistant magnesium alloy. There are two versions of the alloy; one contains 10% gadolinium, 3% neodymium and 0.4% zirconium, while the second contains 10% dysprosium (instead of gadolinium), while the percentages of the other components remain the same. These new rare earth alloys have a 30% greater tensile strength than the commercial standard alloy WE54A, with a corrosion resistance and fracture toughness comparable to WE54A. Production of this alloy has been started for making automobile engine parts. {**Jap. New Mater. Rept. 9** [6] 2 (Nov.-Dec. 1994)}

The third alloy is a 20% chromium-5% aluminum steel containing small amounts of lanthanum (up to 0.08%) and zirconium (0.05%) as catalytic converter substrates. This stainless steel alloy was developed by Kawasaki Steel Corp. for converters placed in the high temperature zone near the engine. According to Kawasaki, the high temperature oxidation resistance is improved by a factor of three when at least 0.08% lanthanum is added to the steel. The room temperature strength is reported to by 370 MPa. {**Adv. Mater. & Process 147** [2] 7 (February 1995)}

Karl A. Gschneidner, Jr.

K. A. Gschneidner, Jr.
Director, RIC