IMOA®
INTERNATIONAL MOLYBDENUM ASSOCIATION

NEWSLETTER
JULY 2002

Membership

Welcome to:

Shangxiang Minmetals Inc, 150 N. Santa Anita Ave, Suite 500, Arcadia, CA 91006, USA
Tel: +1 626 445 8946;
Fax: +1 626 445 6943.

Trading of molybdenum concentrates, technical oxides, ferro-molybdenum, molybdenum chemicals and metals; also representing producers in China for purchasing raw materials and marketing their molybdenum products

E-mail and website addresses

Please note that these have been changed to: **info@imoa.info** and **www.imoa.info** as from 1 June 2002.
The old addresses will operate in tandem for a while.

A radical re-design of the website has recently taken place to make access easier to the Association's wide variety of activities and publications.
For information about IMOA and molybdenum, this is the place to find it. Further improvements are planned.

NO DATA – NO MARKET!

The EU New Chemicals Policy …and the impact it will have on the worldwide Molybdenum industry.

This is not a Directive which concerns only EU countries: it concerns all companies anywhere in the world which manufacture in, export to, or import from, the EU. And chemicals include metals and alloys. The best way to ensure that a company is prepared for implementation in 2005 is through a trade association to avoid duplication of efforts and resources and, with a similar view in mind, IMOA is co-operating with other metal trade associations.

The impact of the Directive will result in a work-load on companies to provide the necessary data and in the need for budget provisions to conduct the required tests on which to base the data. All companies in the moly industry will have to participate and any company which believes that it can benefit from data compiled without contributing to the exercise will be in for a shock as the issue of 'free-riders' is already being addressed.

Here is the basic picture to-date of the far-reaching implications of the NCP.

◆ In its present form, the EU New Chemicals Policy will require manufacturers within, exporters to and importers from the EU, to register comprehensive data about the properties of their product, and its impact upon human health and the environment.

◆ Within this policy, the EU aims to implement its new chemical control system, REACH, for existing chemical substances under the EINECS register, by 2004. (EINECS is the European Inventory of Existing Commercial Chemical Substances. It is a closed list of over 100,000 'existing' chemicals, governed by EU Regulation no. 793/93 on the evaluation and control of the risks of existing substances).

◆ REACH is the acronym for the Registration, Evaluation and Authorisation of Chemicals. There are set tonnages and dates for each heading.

◆ 'Chemicals' include metals and alloys. Why? Because EINECS defines 'Substances' as: 'Chemical elements and their compounds in the natural state or obtained by any production process …….'

◆ This EU NCP will be enforced by a system of Registration. Companies failing to present satisfactory data will be breaking the law by continuing to trade, so effectively this means 'No Data – No Market'.

◆ Draft EU NCP legislation is expected to be published by October 2002, and is scheduled to come into force as a European Regulation by 2004. At the moment, it is in the form of a White Paper (published in February 2001), which can be downloaded from the Internet on:
http://europa.eu.int/comm/environment/chemicals/whitepaper.htm

◆ Registration will include the requirement for comprehensive data about toxicity and ecotoxicity, exposure levels throughout the supply chain, risk assessment and risk management information.
The EU NCP puts the burden of proof squarely upon the shoulders of industry.

Take note, do not hide the company head in the sand, and be prepared to co-operate with, and contribute to, the work of your relevant trade association. If your company is involved in the moly industry and does not already belong to IMOA, think about joining – membership could save you a lot of money and effort.

INTERNATIONAL MOLYBDENUM ASSOCIATION
2 Baron's Gate, 33 Rothschild Road, London W4 5HT, UK
Tel: +44 20 8742 2274 Fax: + 44 20 8742 7345
email: info@imoa.info web: www.imoa.info

Moly Does the Job

This case study has been provided by Dave Bennett of M&M Engineering and has been written up by IMOA consultant John Grocki of Advantage Resources Consulting.

Summary

A rendering plant has been using a Type 304L stainless steel (SS) heat exchanger to condense the rendering cooker gases and heat plant water. After two years the unit experienced leaks in both the shell - mostly at the welds - and the tubes. Metallurgical evaluation of the shell plate failure area revealed both pitting and chloride stress corrosion cracking (CSCC). Microbiologically influenced corrosion (MIC) was suspected, but could not be confirmed.

A recommendation was made to replace the Type 304L heat exchanger with a new unit constructed from molybdenum containing 2205 duplex stainless steel (DSS). Because of its significantly increased corrosion resistance, the new unit's life is expected to be many years longer than that of the original unit.

The Process

The vertical, single-pass heat exchanger uses steam/vapor from the rendering cooker inside the tubes to heat plant water on the shell side. The rendering steam enters the exchanger at 300°F [149°C] and cools to 260°F [127°C]. The water supply is softened and chlorinated potable water, entering the unit at around 60° F [16° C], and exiting it at around 200° F [93° C]. The water contains no more than 50 ppm chloride and 1.5 ppm residual chlorine. The unit operates about 18 hours per weekday. During downtime the shell side remains filled with plant water.

The Corrosion

The Type 304L SS heat exchanger developed leaks at weld seams in the shell and in the tubes. The molybdenum free Type 304L SS has inadequate resistance to pitting corrosion in chloride-containing waters above 150°F [66° C], especially at welds and in the heat affected zone. CSCC also is possible at temperatures above 160°F [71° C], even with chloride levels of only a few ppm. While 2% molybdenum-containing Type 316L SS is more resistant to pitting corrosion than 304L SS, it is not much more resistant to CSCC at temperatures above 160°F [71° C].

Inadequate post-weld cleaning and rough grinding marks on the surface accelerated localized corrosion of the shell. However, pitting corrosion also occurred on the hot end of the solution-annealed Type 304L SS tubes. ***Figures 1*** through ***3*** show the corrosion defects.

Figure 1.
View of the horizontal weld piece, showing pitting in the base plate (A) and the weld (B). The surface has a brown stain/deposit. The dark color band right next to the weld bead indicates inadequate post-weld cleaning. The coarse grinding marks also lower the pitting resistance.

The Solution

The corrosion problems are being addressed by upgrading the material to a stainless steel with significantly higher resistance to both pitting and CSCC than Type 304L. The selected 2205 DSS resists chloride pitting and CSCC at temperatures up to 220° F [104 °C] in waters with chloride levels up to 2,000 ppm. ***Figures 4*** and ***5*** give pitting and CSCC resistance data for the discussed stainless steels. They show the vastly superior resistance of the 3.1 %

Figure 2.
Cross-section through the deepest cavity in a vertical weld sample: deep pitting corrosion damage and lack of fusion (LOF) in the weld.

Figure 3
Macro-photograph of chloride stress corrosion cracking (CSCC) in the base plate adjacent to the vertical weld, showing classic, branched, intergranular morphology and growth from the internal surface outwards

molybdenum-containing, duplex alloy 2205 compared to both Type 304 and 316 austenitic SS.
The nominal chemical compositions for 2205 DSS and Types 304L and 316L SS are shown in **Table 1.**

The Cost Savings

Table 2. provides the relative costs of the materials and the fabricated heat exchanger in three different stainless steels, Types 304L, 316L and 2205 if no design changes are made.
The moderately higher material and fabrication costs for 2205 DSS could be partially offset by redesigning the unit, using its two times higher yield strength to decrease the wall thickness and therefore the weight of the shell and the tubes. As the 2205 DSS should provide at least times longer service life than the 304L SS

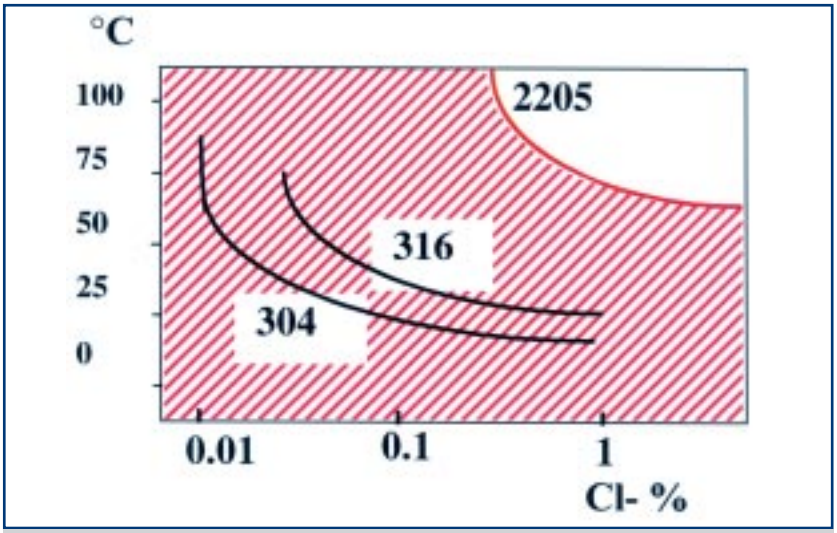

Figure 4.
Pitting corrosion resistance for different stainless steel grades: The effects of temperature and chloride contents are shown. Above the curved line pitting occurs, below it there is no pitting expected.

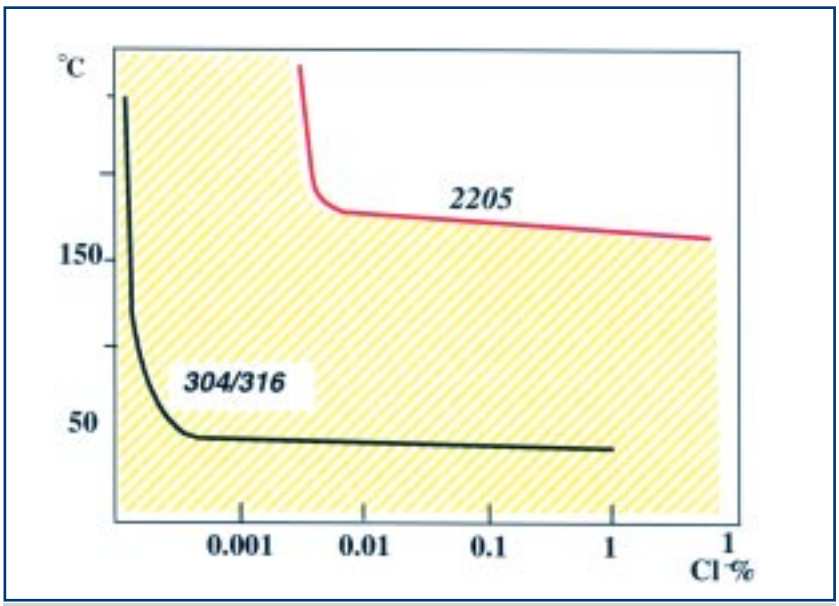

Figure 5.
CSCC resistance in neutral, aerated aqueous solutions for different stainless steels. No CSCC is expected to the left below the curves.

unit, the life cycle cost savings become significant. The rough life cycle cost calculations shown in **Table 2** do not even include inflation adjustments, cost of labor to install a replacement unit, or cost of downtime because of an unexpected leak. The estimations only include the direct cost of purchasing a new Type 304L unit every two years or a Type 316L unit every four years at today's prices.

Grade	UNS Number	**Molybdenum**	Chromium	Nickel	Nitrogen	Carbon Max.
304L	S30403	**-**	18	9	-	0.03
316L	S31603	**2**	17	11	-	0.03
2205	S32205	**3.1**	22.1	5.6	0.16	0.02

Table 1. Typical chemical compositions of stainless steel grades.

Grade	Relative Material Cost	Relative Fabricated Unit Cost	Relative Life Cycle Cost
304L	1.00	1.00	1.00
316L	1.25	1.22	0.61
2205	1.33	1.30	**0.27**

Table 2. Relative material cost, fabricated unit cost and life cycle costs under the assumption that Type 316L would last twice as long and 2205 five times as long as Type 304L. Significant cost savings can be achieved over the assumed minimum life cycle of ten years with a 2205 heat exchanger as compared to a Type 304L or 316L exchanger.

The ICDA, IMOA and NiDI stand at the 4th European Stainless Steel Science and Market Congress

4th European Stainless Steel Science and Market Congress

This conference and exhibition was held in Paris, 10-13 June, 2002. For the first time, IMOA shared an exhibition booth with the other major stainless steel alloying element trade associations, the International Chromium Development Association (ICDA) and the Nickel Development Institute (NiDI). Our stand was placed between the stands of Euro Inox and the International Stainless Steel Forum (ISSF). This front of stands by the non-profit stainless steel development associations was a demonstration for our commitment to combining forces and conducting projects together in "Team Stainless".

The conference attracted almost 400 delegates.There were about 120 presentations and 30 posters given at the conference. The papers were presented in three parallel sessions, grouped by the following topics: Auto and Transport, Building and Architecture, Energy and Process Industries, Food and Health, Health and Environment, Innovative Routes for Working with Stainless Steel, Innovative Production Routes, Surface Treatment and Surface Properties of Stainless Steels, Guidelines and Standards, Austenitic, Duplex, Ferritic and Martensitic Stainless Steels.

Because of IMOA's past work in the area of duplex stainless steel, Nicole Kinsman chaired a session on the topic.
The presentations focused on scientific research results from the stainless steel industry, independent research laboratories and universities, but covered also some market development aspects. Overall, the conference was aimed at visitors from within the stainless steel industry and this was the audience it attracted.

The organisers of similar conferences in the future might perhaps consider programmes which offer greater interest to end-users and encourage their participation.

IMOA'S MARKET DEVELOPMENT PROGRAMME

This programme (MDP in short) is designed with the primary objective of promoting the usage of Mo-containing stainless steels for select high potential applications. The principal advantage of these stainless steels is that their corrosion resistance in aggressive environments is better than that of molybdenum free stainless steel.

In implementing the MDP, IMOA is co-operating and coordinating efforts informally as much as possible with stainless steel producers, NiDI, ICDA, Euro-Inox, ISSF and SSDAs around the world. All companies with the same concerns are invited to contact IMOA.

"Team Stainless" is a slightly more formal group, comprising representatives of Euro Inox, ICDA, NiDI, ISSF and IMOA. It was founded at the initiative of ICDA and is holding meetings once or twice a year to coordinate joint market development efforts and industry responses to problems and questions facing the stainless steel industry.

The focus of IMOA's strategic initiatives is the promotion of Mo containing stainless steel in the following applications:

- Architecture, building and construction (ABC): aggressive outdoor applications.

- Potable water distribution: large diameter piping.

- Automotive: exhaust systems, trim, fuel tanks, fuel cells, etc.

ABC materials decision makers are suffering from a lack of knowledge about the properties of different stainless steels. A moly-free grade is often selected by architects when a moly-containing stainless is necessary to avoid corrosion. Catherine Houska of TMR Stainless has been hired by IMOA to carry out this project in the US. She has worked in this market for NiDI for eight years. The main thrust is to provide materials decision makers with information so they may select the "right" stainless steel for a given situation. Case histories will be compiled and distributed in the USA and Europe to architects; articles written for specific trade journals; and presentations made to architecture and fabrication firms.

Secondly, Water. Today very little, if any, stainless steel is used in large diameter potable water distribution lines in the US. However, these systems have extensive corrosion problems, leading to water loss and water contamination in traditional systems. Over 200,000 miles of piping are replaced every year.

IMOA has hired John Grocki of Advantage Resources Consulting, L.L.C. for this project to identify and develop good contacts in this field and define the exact value proposition of moly containing stainless steels. While stainless is not used much in the US for this application, it has been used in Italy, Sweden, Switzerland, Germany and Japan and experience will be drawn from these countries.

Thirdly, Automotive. The automotive market requires more work to define the potential. There are some applications which are already using moly-containing stainless steels such as automotive exhaust systems and trim, but other applications are about to emerge which could use moly - containing stainless steels such as fuel tanks and fuel cells. IMOA plans to talk to auto makers and suppliers of sub-systems to identify opportunities to promote the use of moly containing stainless steels.

These three areas may provide the key focus for IMOA's future MDP but the Association is active in many other fields, notably the preparation of a brochure on guidelines to the fabrication of austenitic stainless steels in conjunction with NiDi and ICDA.

IMOA's 14th Annual General Meeting

Monday 21 to Thursday 24 October, 2002

Hotel Fiesta Americana, Hermosillo, Mexico
Hosted by Molymet and Grupo Mexico

PROVISIONAL PROGRAMME

Monday 21 October

14:00–17:00 Meeting of the HSE Committee

Tuesday22 October

13:30–18:00 Meeting of the Executive Committee
19:00–20:30 Opening of Mining Seminar Sonora 2002
21:00 Cocktails and dinner

Wednesday 23 October

Annual General Meeting
09:00-09:45 Welcome and Administration
09:45-10:00 Report on work of the Assaying Committee (Sandra Carey, IMOA)
10:00-10:30 Report on work of the HSE Committee (Carmen Venezia, Osram Sylvania Products and Sandra Carey, IMOA)
10:30-11:00 Economy of South America (speaker to be confirmed)
11:00-11:30 Coffee break
11:30-12:00 Molybdenum Market Update (Terry Adams, Adams Metals)
12:00-12:30 Potential for Stainless Steel Usage in China (Peter Kaumanns, Senior Manager of Market Research, Thyssen Krupp Stainless)
12:30-14:00 Lunch
14:00-14:30 Measurement and Impact of Promotional Projects (Jürgen Liebbrandt, Codelco)
14:30-15.30 Market Development Programme (Nicole Kinsman, IMOA)
19:30 Dinner at Quinta Napoles, hosted by Molymex
Special Guest: Sonora State Governor

Thursday 24 October

Field Trip
08:30 Bus departure to airport
Flight to La Caridad
Visit to La Caridad mine
Flight to Molymex
Visit to Molymex
13:00 Lunch at Molymex facilities
16:00 Return flight to Hermosillo (arrive at hotel 17:30)

Given the venue and Chilean and Mexican hospitality, the event is expected to be lively!

Companies which are not members of IMOA may apply to the Secretariat for details and conditions of attendance.

INTERNATIONAL MOLYBDENUM ASSOCIATION

LIST of MEMBERS

Secretary-General: Michael Maby

AUSTRIA

Interalloys Trading & Business Consulting GmbH
Floragasse 7,A-1040 Vienna, AUSTRIA
Tel: + 43 1 504 6138; Fax: + 43 1 504 6192
E-mail: interal@ycn.com

Treibacher Industrie AG
A-9330 Althofen, AUSTRIA
Tel: + 43 4262 5050; Fax: + 43 4262 2813
E-mail: tam@treibacher.at http://www.treibacher.at

BELGIUM

ALZ NV
Genk-Zuid: Zone 6A, B-3600 Genk, BELGIUM
Tel: + 32 89 302 401; Fax: + 32 89 302 106
E-mail: info@ugine-alz.arcelor.com http://www.ugine-alz.com

Sadaci NV
Langerbruggekaai 13, B-9000 Gent, BELGIUM.
Tel: + 32 92 540 511; Fax: + 32 92 540 571
E-mail: msmeets@sadaci.be http://www.sadaci.be

CANADA

Highland Valley Copper
500 – 200 Burrard Street
Vancouver BC, V6C 3L7, CANADA
Tel: +1 604 685 3042; Fax: +1 604 685 3046
E-mail: bruce.mulleny@teckcominco.com

CHILE

Codelco Chile
Huerfanos 1270, Santiago, CHILE
Tel: + 56 2 690 3406; Fax: + 56 2 690 3366
E-mail: jleibbra@stgo.codelco.cl http://www.codelco.cl

Molibdenos y Metales S.A.
Huærfanos 812, 6th Floor, Santiago, CHILE
Tel: + 56 2 368 3600; Fax: + 56 2 633 4429
E-mail: info@molymet.cl http://www.molymet.cl

CHINA

Chaoyang Jinda Molybdenum Co., Ltd
8 Nanda Street, Chaoyang, Liaoning, 122000, P R CHINA
Tel: + 86 421 2651 117 Fax: + 86 421 2651 887
E-mail: cymoly@mail.cyptt.ln.cn

Jiangsu Fengfeng Tungsten & Molybdenum Products Co., Ltd
Tang Jia Se
The Northern Suburbs of Dongtai, Jiangsu, CHINA
Tel: + 86 515 523 1237; Fax: + 86 515 523 5949
E-mail: dmcp@pubic.yc.js.cn

Jinduicheng Molybdenum Mining Corporation
17th Floor, Jie Rui Mansion, No. 5 West section of the second south Ring Road,
Xian Shaanxi, Province, P.C. 710068, P.R. CHINA
Tel: +86 29 837 8676 Fax: +86 29 837 8771
E-mail: jck@jdcmmc.com http://www.jdcmmc.com

Jinzhou Sing Horn Enterprise Co., Ltd
No.56, Shangdali, Taihe District, Jinzhou Liaoning 121004, CHINA
Tel: + 86 416 517 1930; Fax: + 86 416 517 1944
E-mail: jzlhshs@mail.jzptt.ln.cnhttp://www.singhorn.com

GERMANY

F W Hempel Metallurgical GmbH
Leopoldstr. 16, D-40211 Düsseldorf GERMANY
Tel: + 49 211 168 060; Fax: + 49 211 168 0644
E-mail: f.-w.hempel@fwhempel.com http://www.fwhempel.de

Metherma GmbH
Arnheimer Str. 103
D-40489 Düsseldorf, GERMANY
Tel: + 49 211 40 80 840; Fax: + 49 211 40 71 26
E-mail: metherma.molybdenum@t-online.de

H C Starck GmbH & Co KG
Im Schleeke 78 - 91, Postfach 25 40
D-38615 Goslar, GERMANY
Tel: + 49 5321 751 0; Fax: + 49 5321 751 192
E-mail: georg.nietfeld.gn@hcstarck.de http://www.hcstarck.com

ITALY

Gerli Metalli SpA
Piazza S. Maria Beltrade 1, I-20123 Milan ITALY
Tel: + 39 02 809 511; Fax: + 39 02 890 0714
E-mail: gerlimetalli@mail.mdsnet.it

JAPAN

Kohsei Co., Ltd
Marukashiwa Building, 6F 1-6-1 Honcho Nihonbashi Chuo-ku,
103-0023 Tokyo, JAPAN
Tel: + 81 3 3270 0303; Fax: + 81 3 3270 7504
E-mail: furuta@kohsei.co.jp

Nissho Iwai Corp
Tradepia Odaiba
3-1, Daiba 2-chome, Minato-ku, Tokyo 135-8655, JAPAN
Tel: + 81 3 5520 3529; Fax: + 81 3 5520 3517
E-mail: matsumura.hiroshi@nisshoiwai.co.jp

Taiyo Koko Co., Ltd
3-1, 3-chome Marunouchi, Chiyoda-ku
Tokyo 100-0005, JAPAN.
Tel: + 81 3 3216 6041; Fax: + 81 3 3216 6045
E-mail: trade@taiyokoko.co.jp

LUXEMBOURG

Considar Europe SA
3 rue Pletzer, Centre Helfent, L-8080 Bertrange LUXEMBOURG.
Tel: + 352 45 99 99 1 Fax: + 352 45 99 99 223
E-mail: heinz.duechting@considar.lu

MEXICO

Mexicana de Cobre SA de CV
Av. Baja California 200, Col. Roma Sur
06760 Mexico DF, MEXICO
Tel: + 52 5 264 7775; Fax: + 52 5 264 7769
E-mail: adenekeng@gmexico.com.mx http://www.gmexico.com

PERU

Southern Peru Copper Corporation
Av. Caminos del Inca 171
Chacarilla del Estanque, Surco, Lima 33, PERU
Tel: + 51 1 372 1414; Fax: + 51 1 372 0237
E-mail: jdlheros@southernperu.com.pe http://www.southernperu.com

SWEDEN

AvestaPolarit Oyj Abp
S-774 80 Avesta, SWEDEN
Tel: + 46 226 810 00; Fax: + 46 226 813 05
E-mail: marie.louise.falkland@avestapolarit.com

Scandinavian Steel AB
Birger Jarlsgatan 15
SE 111 45 Stockholm, SWEDEN
Tel: + 46 8 614 2850; Fax: + 46 8 611 6434
E-mail: metals@scandinaviansteel.se

UK

Adams Metals Ltd
Norwich House, 14 North Street
Guildford, Surrey GU1 4AF, UK
Tel: + 44 1483 577900; Fax: + 44 1483 578008
Toll Free/ USA– Tel: +1 800 473 8427; Fax: +1 800 473 8428
E-mail: adamsmetals@btinternet.com http://www.adamsmetals.com

Brandeis Ltd
Pechiney House, The Grove, Slough, Berkshire SL1 1QF
Tel: +44 1753 522 800; Fax: +44 1753 825 033
E-mail: Christian_Masson-Brandeis@Pechiney.com

Eastlink Ferro Alloys Ltd
Surrey Street, Glossop, Derbyshire SK13 7AL UK
Tel: + 44 1457 852333; Fax: + 44 1457 855655
E-mail: david.l@eastlinklanker.com
http://www.ferroalloys.demon.co.uk

Alfred H Knight International Ltd
Eccleston Grange, Prescot Road
St Helens, Merseyside WA10 3BQ, UK
Tel: + 44 1744 733757; Fax: + 44 1744 27062
E-mail: st-helens@alfred-h-knight.co.uk

Derek Raphael & Co Ltd
2nd Floor, 6 York Street, London W1U 6PL, UK
Tel: + 44 20 7535 1690; Fax: + 44 20 7535 1691
E-mail: DRaphael@derek-raphael.co.uk http://www.derek-raphael.co.uk

Alex Stewart (Assayers) Ltd
Caddick Road, Knowsley Industrial Estate
Merseyside LL34 9ER, UK.
Tel: + 44 151 548 7777; Fax: + 44 151 548 0714
E-mail: enquiries@ alexstewart.com

Wogen Resources Ltd
4 The Sanctuary, Westminster, London SW1P 3JS, UK.
Tel: + 44 20 7222 2171; Fax: + 44 20 7222 5862
E-mail: akerr@wogen.co.uk http://www.wogen.com

USA

American Flux & Metal
P O Box 74 - Fleming Pike, Winslow, NJ 08095, USA
Tel: + 1 609 561 7500; Fax: + 1 609 561 3724
E-mail: flux@bellatlantic.net http://www.americanflux.thomasregister.com

Bear Metallurgical Company
679 East Butler Road, Butler, PA 16001, USA
Tel: + 1 724 283 6800; Fax: + 1 724 283 6078
E-mail: kjones@bearmet.com

The Chem-Met Co
P O Box 819, Clinton, MD 20735-0819, USA
Tel: + 1 301 868 3355; Fax: + 1 301 868 8946
E-mail: afox@chem-metco.com

Climax Molybdenum Company
One North Central, Phoenix, AZ 85004, USA
Tel: + 1 602 366 8100; Fax: + 1 602 366 7329
E-mail: dthornton@phelpsdodge.com http://www.phelpsdodge.com

Comsup Commodities Inc
1 Bridge Plaza North, Fort Lee, NJ 07024, USA
Tel: + 1 201 947 9400; Fax: + 1 201 461 7577
E-mail: comsup@earthlink.net

Kennecott Molybdenum Company
8315 West 3595 South, P O Box 6001,
Magna Utah 84044-6001, USA
Tel: + 1 801 252 3000; Fax: + 1 801 252 3292
E-mail: sullivas@kennecott.com

Molycorp Inc
376 S. Valencia Avenue, Brea,California 92823, USA
Tel: + 1 714 577 1757 ; Fax: + 1 714 577 2779
E-mail: cjcynor@unocal.com

Osram Sylvania Products Inc
Hawes Street, Towanda, PA 18848, USA.
Tel: + 1 570 268 5000; Fax: + 1 570 268 5113
E-mail: susan.dunn@sylvania.com

Powmet Inc
P O Box 5086, 2625 Sewell Street
Rockford, IL 61125, USA.
Tel: + 1 815 398 6900; Fax: + 1 815 398 6907
E-mail: wct@powmet.com

H. C. Starck
21801 Tungsten Road, Cleveland
Ohio 44117, USA
Tel: + 1 216 692 4452; Fax: + 1 216 692 0031
E-mail: jcdurham@worldnet.att.net

Shangxiang Minmetals Inc.
150 N. Santa Anita Ave. Suite 500,
Arcadia, CA 91006, USA
Tel: + 1 626 445 8946; Fax: + 1 626 445 6943
E-mail: georgesong@e-metalmarket.com

Thompson Creek Metal Company
945 West Kenyon Avenue, Englewood
CO 80110-3469, USA
Tel: + 1 303 761 8801; Fax: + 1 303 761 7420
E-mail: marionc@tcrk.com