Serving The Needs of Science and Industry Worldwide
Au service de la Science et de l’Industrie dans le monde entier
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Standard Price List for All Microleafs

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**Introduction**

Goodfellow is well known as a specialist supplier of small to medium size quantities of metals, alloys, ceramics, polymers and other materials to meet the research, development and specialist production requirements of science and industry worldwide. We realise that "small" means different things to different people, but we consider small to mean any quantity from a few grammes to a few kilos.

Goodfellow offers two distinct services to meet the requirements of our customers:

- The first meets the needs of our customers who need small quantities of products from our standard range of materials within 24-48 hours.
- The second service is for those who require larger quantities or further processing of our standard products or who need an item which falls within our general area of supply expertise.

The range of materials offered by Goodfellow is extensive, as are the forms in which the various products are available. This Catalog provides a detailed overview of our standard products which are available from stock. Full details of all of these items, including prices and technical information, can be found in our web Catalog at www.goodfellowusa.com.

**Materials**

**Metals and Alloys**

Goodfellow supplies virtually all of the pure metals from Aluminum to Zirconium as well as a comprehensive range of alloys. Most are available in a variety of forms, including rod, wire and foil. The Catalog details those materials which are available as standard products from stock. Custom-made items are also available, so please contact us if you are unable to identify the item you require.

**Ceramics**

The ceramic materials offered by Goodfellow have been carefully chosen and include both the established as well as more recently developed products. All are available as either standard or custom-made products in a variety of forms and sizes. The Catalog details those items which are available from stock. For ceramic components made to customer drawings, our Ceramic and Glass Division would be delighted to help. Please visit www.goodfellow-ceramics.com for further information.

**Polymers**

The range of polymers supplied by Goodfellow is broad and includes both the familiar as well as some of the more unusual or recently developed materials. The Catalog details those items which are available from stock; please contact us if you are unable to find the item you specifically require.

**Compounds & Intermetallics**

Goodfellow can supply aluminides, borides and silicides as well as other intermetallics and compounds. The majority of these items are made to order, and the Catalog details those which are available. Please contact us with details of your requirements.

**Composites**

Some examples of these materials are listed in the Catalog. As some of these are manufactured on a custom-made basis, please contact us with details of your requirements.

**Glasses**

Goodfellow offers two distinct types of glass products. The first are generally silica-based and transparent. Generally, these products are made to order for customers, so we do not list them in our Catalog, however, they are available through the Goodfellow Ceramic and Glass Division. Please contact us with your requirements.

The second type of glass product is commonly referred to as "metallic glasses" or "glassy metals". In contrast to crystalline metals and alloys with highly ordered atomic structures, these are non-crystalline (amorphous) metals or, more usually, alloys. Our Catalog details those glassy metals which are available from stock; please contact us if you are unable to find the item you specifically require.
## Product Descriptions

### Bar

A straight length of rectangular, square or oval section material.

**Tolerances**

<table>
<thead>
<tr>
<th>Section dimensions:</th>
<th>± 10%&lt;br&gt;≤ 10mm</th>
<th>± 1mm&lt;br&gt;10mm&lt;br&gt; &gt; 10mm</th>
<th>± 1mm&lt;br&gt;≤ 100mm</th>
<th>± 5%/ -1%&lt;br&gt; &gt; 100mm</th>
</tr>
</thead>
</table>

### Bolt

A threaded pin that can be screwed into a nut or a tapped hole to fasten items together. Bolts are available with different head styles and also in metric and inch-threaded sizes.

### Chopped Fiber

Fibers cut into short lengths called cut, staple or chopped fiber.

**Tolerances**

| Fiber diameter: | ± 25% |
| Number of strands: | ± 10% |
| Tex number: | ± 10% |
| Length: | +5%/ -1% |

### Crucible

A vessel in which other materials may be heated or melted, usually at high temperatures.

**Tolerances**

| Height: | ± 10% |
| Inside Dimensions: | ± 10% |
| Outside Dimensions: | ± 10% |

### Fabric

Woven fabrics are made by the regular interlacing of two arrays of yarns at right angles to each other, these being referred to as the warp and weft (see also Non-woven fabric).

**Tolerances**

| Fabric thickness: | ± 25% |
| Number of yarns: | ± 10% |
| Tex number: | ± 10% |
| Size (linear dimension): | < 100mm: ± 5mm<br> ≥ 100mm: ± 5% |

### Fiber

Yarns or tows consisting of several approximately parallel individual filaments, each filament usually being smaller in diameter than a monofilament. Yarns contain a defined number of filaments, typically three to several hundred; tows contain thousands of filaments whose number is only defined approximately. Both are primarily specified by their linear density measured in "tex", the weight in grams of a 1km length of material.

**Tolerances**

| Fiber diameter: | ± 25% |
| Number of strands: | ± 10% |
| Tex number: | + 10% |
| Length: | +5%/-1% |

### Film

A non-metallic sheet material with a thickness < 0.5mm.

**Tolerances**

| Thickness: | ± 20% |
| Size (linear dimension): | < 100mm: ± 1mm<br> ≥ 100mm: ± 2%/ -1% |

### Flake

Flat, irregularly shaped pieces of material. A maximum flake size is indicated but individual flakes may vary greatly in size.

**Tolerances**

Dimensions shown are nominal
**Product Descriptions**

- **Foam**
  A low density, permeable structure of cells and continuous ligaments offering a high surface area to volume ratio, and also a high strength to weight ratio. Owing to the nature of this material, dimensions are nominal.

- **Foil**
  Thin sheets of pure metal and metal alloys. Due to their fragile nature, some foils are coated on one side with an acrylic or polyester support. Where foils are supported they are indicated in the detailed item description.

- **Granule**
  Pellets of an approximately regular shape. Granules may vary in size and, therefore, the dimensions stated are nominal. In addition, the shape of a granule may vary from item to item.

- **Honeycomb**
  A cellular structure similar in appearance to natural honeycomb. Owing to the nature of this material, dimensions are nominal.

- **Insulated Wire**
  A single or multiple flexible strand of metal or alloy with an insulating sheath.

- **Laminate**
  Layers of material which have been bonded together by the use of heat, pressure and, possibly, adhesive.

- **Lump**
  A solid piece of material with no defined shape.

- **Mesh**
  Mesh is available as either a woven wire or electroformed product; in all cases, the quoted aperture sizes are nominal. Wire mesh: a material which is woven from metal wires to provide a thin grid with a regular series of holes. Electroformed mesh: a product made by electroplating the mesh geometry through a mask onto a substrate which is subsequently etched away.

- **Metallized Film**
  Film which is coated with a metal. The thickness of the metal is measured and described in terms of the material’s specific electrical resistance in ohms per square.
Microfoil

An extremely thin sheet of metal or alloy mounted on a permanent support. This support cannot be removed without destroying the Microfoil.

**Tolerances**
- Thickness: ±30%
- Size: ±20%

Microleaf

An extremely thin sheet of metal mounted on a removable support. Microleaf is not available for metals which are too brittle to be free standing.

**Tolerances**
- Thickness: ±30%
- Size: ±20%

Monofilament

A single strand of a non-metallic material.

**Tolerances**
- Diameter: ±20%
- Length: +5% / -1%

Non-Woven Fabric

Non-woven fabrics are made by methods other than weaving or knitting, the yarns and fibers being held together, often quite loosely, by means other than geometric interlacing. Due to the open and porous nature of this material, all other dimensions are nominal.

**Tolerances**
- Size (linear dimension): <100mm ±5mm
- Size (linear dimension): ≥100mm ±5%
- Length: <100mm ±1mm
- Length: ≥100mm ±5% / -1%

Nut

Generally a flat piece of material with a threaded hole which can be screwed onto a bolt to fasten items together. Nuts typically have a hexagonal external shape. Nuts are available in metric and inch-threaded sizes.

**Tolerances**
- See item

Powder

Small particles with an approximately defined size range. Those materials described as alloy precursors are not true alloys - they are made by sintering a blend of powders of the component metals to achieve alloying by diffusion. The resultant cake is ground and sieved to the required particle size range. Unless otherwise stated, the particle sizes shown are for guidance only. We do not guarantee either any particular size distribution between the quoted minimum and maximum sizes, or a specific particle shape.

**Tolerances**
- Dimensions shown are nominal

Rod

A straight length of circular section material.

**Tolerances**
- Diameter: ≤10mm ±10%
- Diameter: >10mm ±5%
- Polymer +20%/-10%
- Ceramic +20%/-10%
- Polymer +20%/-10%
- Ceramic +20%/-10%
- Length: <100mm ±1mm
- Length: ≥100mm ±5% / -1%
### Sheet
Flat material with a thickness $>0.5\text{mm}$.

**Tolerances**
- Thickness: $\pm 10\%$
  - Ceramic: $\pm 10\%$
  - Composite: $\pm 20\%$
  - Polymer: $\pm 20\%$
- Size (linear dimension): $<100\text{mm}$: $\pm 1\text{mm}$
  - $\geq 100\text{mm}$: $\pm 2\% / -1\%$

### Single Crystal
A material grown as a monocrystal, generally to a specific orientation, dimension and surface finish. It may contain a dopant. Single crystals are usually made to order.

**Tolerances**
- Orientation: $\pm 3^\circ$
- Size: Sizes shown are nominal

### Sphere
A regular solid or hollow three-dimensional form in which every cross-section is a circle. Spheres are available with standard or precision tolerances, and can be supplied with different surface finishes depending on the material.

**Tolerances**
- Diameter (standard): $\pm 5\%$
- Diameter (precision): see item

### Tube
A hollow length of material normally circular in section. Most tubes are straight except those made of flexible polymer.

**Tolerances**
- Outside diameter:
  - $\leq 2\text{mm}$: $\pm 0.05\text{mm}$
  - $\leq 5\text{mm}$: $\pm 0.1\text{mm}$
  - $>5\text{mm}$: $\pm 5\%$
- Wall thickness: $\pm 10\%$
  - Polymer: $\pm 10\%$
  - Ceramic: $\pm 10\%$
- Length:
  - $<100\text{mm}$: $\pm 1\text{mm}$
  - $\geq 100\text{mm}$: $\pm 5\% / -1\%$

### Washer
A thin, flat piece of material with a hole in the middle, used in conjunction with bolts and nuts to distribute the load of a threaded fastener.

**Tolerances**
- See item

### Sputtering Target
A high purity material used as a source for sputtering, a cold vaporization process in which atoms are physically removed from the target surface by ion bombardment.

**Tolerances**
- Thickness: $\pm 0.5\text{mm}$
- Size: $\pm 0.5\text{mm}$

### Wire
A single or multiple flexible strand of pure metal or alloy.

**Tolerances**
- Wire diameter: $\pm 10\%$
- Length: $+5\% / -1\%$
HAZARDS

All materials listed in this catalog, whatever the quantity supplied, are sold for research or development purposes. We make no warranty that the materials are fit for a particular purpose. In purchasing materials from this catalog, customers should be aware that there may be hazards associated with their use and in the handling of them. Complete toxicological or hazard investigations are the responsibility of the customer. Ingestion or contact with the human body may be harmful. The responsibility for the safe use of our products rests with the customer. All materials should be handled by qualified personnel familiar with laboratory procedures and who are familiar with the nature of the material and any necessary precautions which should be taken in the handling, use and storage of the products. The customer shall be responsible for the control and use of the products offered in this catalog whether alone or in combination with other articles or substances or in any other manner whatsoever.

HAZARD SYMBOLS

**Corrosive**
Chemicals which may destroy living tissue when in contact with them.

**Dangerous when wet**
Chemicals which, in contact with water or damp air, evolve highly flammable or toxic gases and vapours in dangerous quantities.

**Explosive**
Chemicals which may react *exothermically* without atmospheric oxygen, quickly evolving gases, and which under defined test conditions detonate, quickly deflagrate or upon heating explode when partially confined.

**Extremely Flammable**
Chemicals which when finely divided (small particle size) are liable to ignite spontaneously.

**Harmful**
Chemicals which may cause death or acute or chronic damage to health when inhaled, ingested or absorbed via the skin.

**Highly flammable**
Chemicals which will ignite after contact with flame, or which will evolve highly flammable gases in contact with water.

**Irritant**
Non-corrosive chemicals which, through immediate, prolonged or repeated contact with the skin or mucous membrane may cause inflammation.

**Radioactive**
Chemicals which will emit ionising radiation without being subject to irradiation. General precautions for Toxic chemicals apply to those of low activity. For chemicals of medium or high activity special regulations apply.

**Toxic**
Chemicals which may cause death or acute or chronic damage to health when inhaled, ingested or absorbed via the skin.

**Very Toxic**
Chemicals which in low quantities cause death or acute or chronic damage to health when inhaled, ingested or absorbed via the skin.
Analyses

**Typical Analysis:**
Where appropriate a typical analysis is given. All figures are parts per million (ppm) by weight unless otherwise stated. It must be emphasised that this data is "typical" and no guarantee is given that the material supplied will conform to these analyses. The compositions shown under alloy headings are generally weight percent. Exceptions are the glassy alloys and the rare earth magnets where the convention of using atomic ratio is followed.

**Purity**
Purities listed are quoted with respect to total metallic impurities. Typical analyses may give additional information about likely non-metallic impurities.

**High Purity**
For materials described in the catalog as High Purity, the actual analysis of metallic impurities will be supplied free of charge. For other items, an actual analysis can be supplied and a charge will be made for the analysis and for the sample used.

If you require an analysis please tell us whether you require analysis of metallic impurities only or metallic and gaseous. Where an analysis is required the shipment of your order may be delayed.

**Supports**
Some items from our range of foils need to be supported on one side of the foil to enable both you and us to handle these very delicate materials. Two types of support can be used, the choice being governed by the material. Wherever possible we use a temporary support, a permanent support only being used when the material is brittle (for example Chromium or Manganese).

The temporary support is Acrylic, approximately 0.2mm thick. This may be removed by dissolving in 2-Propanone (Acetone).

Our permanent support is Polyester, thickness 0.125mm, which is hot-press laminated to one face of the foil. It **cannot** be removed without destroying the foil.

Microfoil is mounted on a permanent 3.5µm polyester support. This support **cannot** be removed without destroying the Microfoil.

**Light Tight (LT) & Not Light Tested (NLT)**
Light tight (LT) foils are supplied without visible pinholes after examination without magnification. Foils 0.025mm or more in thickness are supplied LT unless otherwise stated.

Foils less than 0.025mm thick are normally supplied Not-Light Tested (NLT), and will normally contain pinholes but may occasionally be free from pinholes. Foils less than 0.025mm in thickness can often be supplied LT but may incur additional charges. Please specify if you require LT foils.

**Vacuum tight**
Vacuum tight foils show no detectable leakage when tested with a helium mass spectrometer with a sensitivity of $10^{-9}$ atm-cm$^3$.s$^{-1}$.

**Continuous Lengths**
If you require material in continuous lengths please tell us when you place your order. Unless otherwise specified, we reserve the right to supply in more than one length.

**Technical Data and Information**
All information and technical data are given as a guide only. Although every effort has been made to ensure that the information is correct, no warranty is given as to its completeness or accuracy.

**Tolerances**
For details of our standard tolerances, please refer to the Product Description section. In many cases, closer tolerances are available but may be subject to an extra charge. If you have any special requirements it is important that you tell us at the time of ordering. This includes special tolerances, dimensional uniformity or any other special requirement which you may have (for example edge finish, packaging, labelling etc.). Please indicate precisely what is required and we shall do our best to meet your specification.
General Information
There are over 70,000 stock packs listed and if you
cannot find what you need amongst them, please
ask for special sizes, thicknesses, tolerances,
dimensions or larger quantities. We are also able to
offer many other pure metals, alloys, polymers and
ceramics to special order.

Prices
All the prices listed are total (lot) prices for the sizes
and quantities listed.
Prices shown are in US$ and include free delivery by
our standard 48 hour service except for those items
marked as "special offer" or dangerous goods with
transport restriction. Prices are subject to change
without notice and orders will be invoiced at prices
ruling on the date of despatch.

Transport Restriction
Some of the materials supplied by Goodfellow are
subject to special transport restrictions. Additional
shipment charges may apply which are dependent
on destination. Please check the individual item on
our website or contact us for details of the charges.
If you intend to have the material transported or sent
onwards please ensure that you are aware of the
relevant transport restrictions.

Delivery
Delivery by UPS or Federal Express is included in
the prices, although alternative methods may be
used depending on the materials ordered.

Split Shipment
All orders are accepted for one shipment on one date
to one address. A charge will be made for split
shipments made at the customer's request.

Special Analysis, Supports or
Tolerances
An extra charge is made for non-standard supports,
alternative tolerances and certificates of analysis.
The analysis is free of charge for items marked "High
Purity".

Cancellations
A charge for cancellation of orders may be made.
The amount will depend on the circumstances.

Express Service
Please inform us if you need to have your goods
shipped urgently. An administrative charge will be
made for this service, details can be found on our
website.

Shipment
We aim to have all items listed in this catalog in stock
in the quantities and sizes listed. We can only
undertake to ship an order on a particular date. The
date of delivery at the customer's address is subject
to the normal variations of the delivery service used.

Despatch
Orders will normally be shipped within 48 hours of
receipt.

Non-delivery
If we have notified you of the shipment of goods and
you have not received delivery within 5 days, please
contact us.

Insurance
All consignments will be insured by us against the
usual risks unless we are instructed in writing to the
contrary.

Export Restrictions
A UK Government export licence may be required for
some items to some destinations. If the item you
require needs a special export licence or an end-use
statement we will inform you at the time you order.

Materials Handling
Many of our materials are extremely delicate and it is
essential every care is taken when handling them.
Special attention is drawn to the extreme fragility of
Microfoil, Microleaf and thinner and finer materials.
All materials are carefully packed to ensure safe
transport of goods to your address. We do not accept
responsible for damage caused by mishandling
once the outer transit packaging has been removed.

Terms of payment
Our normal terms of payment are net 30 days from
date of invoice. Any alternative terms of payment
are to be agreed with us in writing at the time of
placing an order. Customers may be asked to pay
cash with order or cash against pro-forma

Please visit www.goodfellowusa.com or email info@goodfellowusa.com for latest prices

© Goodfellow Corporation
Order information

invoice with their first order. In order to establish a credit account we will require details of your bankers, along with two trade references.

Credit account

We endeavour to keep our costs down and customers are requested to pay our invoices on time. We reserve the right to delay delivery if there are overdue invoices on the account. Accounts which remain unpaid beyond the due date may incur an interest charge at a rate of 2% per month.

Credit card payments

We also accept payment using the following credit and charge cards:

Mastercard, VISA and American Express.

VAT

VAT number for Goodfellow Cambridge: GB 2128527 79

UK

VAT will be added to the invoice at the rate ruling at the date of invoice. Where a customer is exempt, VAT will be charged unless we receive a copy of the exemption form at the time the order is placed.

EU

Customers registered for VAT who provide their local registration number will not be charged UK VAT.

Customers who are exempt from VAT will not be charged UK VAT provided we are given a copy of their exemption form at the time the goods are ordered.

Customers not registered for VAT or who fail to give us their registration number will be charged UK VAT at the current rate.

Export

All exports to countries outside the EU are zero-rated for UK VAT unless the invoice is being paid from within the EU.

Return of goods

We will only accept return of goods provided we are contacted BEFORE the goods are returned. When we agree to the return we will issue a Goods Return Number and give instructions for the method of return of the goods. Goods will not be accepted for return without a valid Goods Return Number. Due to the nature of some of our materials, it is imperative that you check any possible transport restrictions with your proposed freight company.

Claims

Great care is taken during manufacture and packing and all items are carefully inspected before shipment. Any claim in respect of short delivery, incorrect material or defective quality must be notified to us in writing within three days of delivery. Please retain ALL packaging for our inspection. Our liability for any such claim shall not exceed the cost of replacement of the goods free of charge, or crediting the customer with the invoice value thereof.

Goods ordered in error

We do not accept responsibility for customers’ errors in ordering. The amount of credit for returned goods will be at our discretion. Where we accept returned goods a restocking charge will be made.

Conditions of sale

All orders, contracts and quotations are subject to our standard terms and conditions of sale.

Information and statements provided are indicative only and do not form part of any offer or contract.

Exclusions

We supply materials according to our specification. All conditions warranties and representations regarding the quality, fitness for purpose or state, size, shape, capacity or color of goods supplied whether expressed or implied by common law or statute or otherwise are hereby expressly excluded. We shall not be liable for any damage direct or consequential arising from the use of goods supplied by us however such damage is caused, nor for delay in delivery.

Law

Customers in the USA: Contracts between Goodfellow Corporation and the customer shall be deemed to be subject in all respects to the laws of the Commonwealth of Pennsylvania, or the United States of America.

Customers in France: Contracts between Goodfellow SARL and the customer shall be deemed to be subject in all respects to French law unless otherwise agreed in writing.
Customers in Germany: Contracts between Goodfellow GmbH and the customer shall be deemed to be subject in all respects to German law unless otherwise agreed in writing.

Customers in the UK and all other countries: Contracts between Goodfellow Cambridge Limited and the customer shall be deemed to be subject in all respects to English law unless otherwise agreed in writing.

Copies of our General Terms and Conditions are available upon request or can be downloaded from our websites at www.goodfellow.com or www.goodfellowusa.com.
Company Structure
The Goodfellow Group consists of five companies:

**Goodfellow Cambridge Limited**
Goodfellow was established in the City of London in 1946. The Company now has subsidiary operations in France, Germany and North America with the Group's research laboratories, workshop facilities & central administration located in Huntingdon, England.

**Goodfellow Corporation**
Established at the same time as our associate company in Germany, Goodfellow Corporation was set up to service the requirements of our customers in the USA.

**Goodfellow GmbH**
Since 1989, this member of the Goodfellow group of companies has been serving the needs of our German speaking customers within Europe.

**Goodfellow SARL**
Goodfellow established an operation in France in 1993 to meet the needs of our French-speaking customers in Europe.

**Goodfellow (Shanghai) Trading Co., Ltd**
Goodfellow established a representative office in Shanghai in 2006, and in 2012 followed this with the creation of a fully-fledged trading company, servicing the research and specialist manufacturing requirements of the Chinese market.

**COMPANY DETAILS**

**Goodfellow Cambridge Limited**
Ermine Business Park
HUNTINGDON
PE29 6WR
England
Registered in England and Wales no. 1188162
VAT registration GB 212 8527 79

**Goodfellow Corporation**
125 Hookstown Grade Road
Coraopolis, PA 15108-9302
USA
A Pennsylvania corporation
EIN 23-2557381

**Goodfellow SARL**
229, rue Solferino
F-59000 Lille
France
Registered in Lille : RCS : B 381 486 836
Siren : 381486836
Numéro de TVA Intracommunautaire :
FR 06 381 486 836

**Goodfellow GmbH**
Am Alstertwiete 3
D-20099 Hamburg
Germany
Registered in Hamburg No. HRB 152991
Import VAT number DE112610478

**Goodfellow (Shanghai) Trading Co., Ltd**
Room 803, Centro Build, No. 568 Hengfeng Road
SHANGHAI
200070
The People's Republic of China

Please visit [www.goodfellowusa.com](http://www.goodfellowusa.com) or email [info@goodfellowusa.com](mailto:info@goodfellowusa.com) for latest prices.
Conditions of Sale

1 GENERAL

1.1 In these Conditions:

1.1.1 the following expressions shall have the following meanings:-

"Buyer"* the individual firm company or other party from whom an order to supply Goods and/or Services is received by the Seller.

"Conditions" the standard terms and conditions of sale of the Seller as set out herein and including any additional terms and conditions of sale agreed in writing by the Seller.

"Contract" a contract for the Supply of Goods and/or Services by the Seller to the Buyer.

"Date of Delivery" the date on which delivery of the Goods or Services takes place pursuant to Condition 7.

"Goods" the goods which the Seller is to supply (or, in respect of which the Seller is to provide Services) under the Contract and includes any of them or any part of them where the context so admits includes raw materials, processed materials and/or manufactured products where processed or supplied for Use

"Prepayment" a payment to be made by the Buyer pursuant to Condition 6.2 to be used at the Seller's discretion for the purchase of materials and/or labour and other costs relating to the supply of Goods;

"Recommendations" the recommendations (if any) relating to the for Use* storage, handling, application and/or use of the Goods contained in the published literature of the Seller (or, if relevant, a Supplier) or any recommendations made in Writing by an authorised representative of the Seller (or, if relevant, a Supplier);

"Seller" Goodfellow Cambridge Limited and any subsidiary or holding company or associate (as such terms are defined in Companies Act 1985 (as amended)) of the said company;

"Services" the work or services or any of them to be provided by the Seller under the Contract;

"Supplier" any person, firm or company who or which supplies materials to the Seller which make up the Goods which are to be supplied to the Buyer;

1.1.2 words importing the singular number shall include the plural and vice versa, words importing one gender shall include all genders, and words importing persons shall include bodies corporate, unincorporated associations and partnerships.

1.2 If satisfactory references and information on the Buyer are not provided within seven days of a request therefore by the Seller, or if, following the provision of such information, the Seller is unable to obtain satisfactory trade indemnity or similar cover in respect of its dealings with the Buyer, the Seller may terminate the Contract and the rights and liabilities of the parties shall be the same as if the Contract had been cancelled in accordance with the provisions of Condition 10.2.

1.3 The seller reserves the right to assign, sub-contract the Contract or any part thereof. The Buyer shall not be entitled to assign the benefit or burden of the Contract without the consent in writing of the Seller.

1.4 In relation to all obligations of the Buyer under these Conditions, the time of performance is of the essence.

1.5 The legal construction of these Conditions shall not be effected by their headings which are for convenience of reference only.

2 ORDERS

2.1 Notwithstanding that the Seller may have given a detailed quotation or estimate either verbally or in writing no order shall be binding on the Seller unless and until it has been acknowledged in Writing by the Seller or the Goods are delivered. The Services are provided by the Seller to the Buyer pursuant to the order.

2.2 In order to avoid duplication of orders the Buyer shall be responsible for ensuring that any confirmation of order previously placed is prominently marked as being a confirmation and not a new order. The Buyer acknowledges that any order or confirmation of order which is not so marked may be treated and accepted by the Seller as a new order to create a Contract in addition to any Contract arising out of the Seller's quotation and the Buyer is advised to check the specification set out in the Seller's quotation before placing an order.

2.3 These Conditions are incorporated in the Contract and together with any matter set out in the Seller's quotation or acceptance (acknowledgement of order containing the entire obligations between the Seller and the Buyer. In the case of any inconsistency between any letter or quotation incorporating or referring to these Conditions and any order, letter or form of contract sent by the Buyer to the Seller, whatever may be their respective dates, the provisions of this conditions shall prevail. In the event of the Seller entering into the Contract without a written quotation or order in accordance with or incorporating or referring to these Conditions but in circumstances where the Buyer has prior notice of the conditions then all Goods or Services supplied shall be subject to these Conditions.

2.4 No variation of the Contract by the Buyer shall be binding upon the Seller unless made in Writing and signed on behalf of the Seller. In the event of such variation the Buyer shall indemnify and keep indemnified the Seller in full against all loss, which term shall include (but without prejudice to the generality thereof) loss of profit, costs (including the cost of labour and material), damages, charges and expenses incurred (directly or indirectly) by the Seller as a result of such variation.

2.5 Any representations (except fraudulent misrepresentations) or warranties made by or on behalf of the Seller prior to the Contract (whether verbally or in writing) are hereby expressly excluded and shall be of no effect.

3 DESCRIPTION

3.1 Any figures, statements, descriptions, illustrations, photographs, drawings, weights or any other matters contained in the Seller's catalogues, pamphlets, price lists or advertising literature are not guaranteed to be accurate and are intended merely to represent a general picture of the Seller's products and shall not form part of the Contract nor be regarded as a warranty or representation relating to the Goods or Services.

3.2 The Seller reserves the right to amend the specification of its products and services from time to time so that the descriptions thereof as set out in its catalogues, pamphlets, price lists or advertising literature may be treated and accepted by the Buyer as a new order to impose upon the Seller any liability whatsoever.

3.3 Unless otherwise agreed in writing, the Buyer will be the sole owner of all inventions, formulations, tools, patterns, designs or other similar items and the copyright in all documents and drawings made or produced by it in preparing a quotation for the Buyer or in the course of work on any Contract with the Buyer.

5 QUOTATIONS

5.1 The Seller's quotations are provisional in so far as they are subject to alteration by reference to any changes in the price of raw materials, any item to be acquired by the Seller from a third party, rates of wages, other costs of production and any other circumstances beyond the Seller's control taking place between the date of the quotation and the Buyer's placing of an order in respect thereof.

6 PRICE

6.1 The Seller shall be entitled to adjust the Contract price of the Goods or Services whether before or after the making of the Contract in the event of any variation in the cost to the Seller of supplying the same or any part thereof caused by:-

6.1.1 any increase in the cost of materials required by the Seller for the completion of the Contract; or

6.1.2 any increase in wages or production and manufacturing costs or other overheads; or

6.1.3 any other reason whatsoever beyond the control of the Seller including (but without prejudice to the generality of the foregoing) fluctuations in exchange rates between monetary currencies the action of any government or any other authority or any labour problems.

6.2 In the Seller's absolute discretion, a Prepayment in respect of the Contract may be required to be made by the Buyer at the cost set out in the Seller's quotation and the Buyer is advised to check the specification set out in the Seller's quotation before placing an order.

6.3 Unless otherwise stated, the price set out in the Seller's quotation includes the cost of packaging, carriage, and (save as provided in Condition 6.4) insurance. In respect of supplies of Goods in the United States of America and Japan the price also includes import duties and sales taxes (if any). In respect of supplies of Goods in other countries the price does not include any sales taxes which will be extra charges based on prevailing rates.

6.4 Where the Buyer requests a particular means of delivery, the price set out in the Seller's quotation does not include in the price, which is to be arranged at the responsibility of the Buyer.

7 DELIVERY

7.1 Delivery of Goods shall be deemed to be effected by the Seller at the following times:

7.1.1 where Goods are collected by or on behalf of the Buyer by its servants or agents, or where Goods are collected by

Goodfellow Corporation

Please visit www.goodfellowusa.com or email info@goodfellowusa.com for latest prices
Conditions of Sale

acquiescence with a means of delivery specifically requested by the Buyer, when the same are collected;

7.1.2 where delivery of the Goods is to be the responsibility of the Seller, when they arrive prior to unloading at the Buyer’s premises or have not been delivered by the Seller, the price shall become immediately due and payable notwithstanding any previous agreement to the contrary but without prejudice to the Seller’s right to any unpaid price for Goods or Services delivered to the Contract and damaged in transit (both direct and consequential) suffered in consequence of such determination

10.1.1 stop any Goods in transit and suspend any further deliveries;

10.2 If the Buyer requires cancellation of the Contract this will only be accepted at the sole discretion of the Seller and unless otherwise agreed in writing only upon condition that any costs, charges or expenses (both direct and consequential) incurred by the Seller up to the date of cancellation and the value of any Goods or damage (both direct and consequential) incurred by the Buyer by reason of such cancellation will be reimbursed by the Buyer to the Seller. Acceptance by the Seller of any cancellation by the Buyer will only be binding upon the Seller if it is made in writing.

10.3 In the event of the Seller other than in any of the circumstances set out in Condition 10.1 being prevented or hindered from completing the Contract either wholly or in part in accordance with the terms thereof for any reason whatsoever beyond its reasonable control which, for the avoidance of doubt and without prejudice to the generality of the foregoing, shall include governmental action, war, riot, civil commotion, fire, flood, epidemic, labour disputes (including labour disputes involving the work force or any part thereof of the Seller or Supplier), disruptions or delays affecting shipping or carriage, licensing, exporting or importing restrictions, currency restrictions and Acts of God then further performance of the Contract shall be either wholly or in part in accordance with the terms and conditions thereof or in such circumstances the Seller may pay to the Buyer the price which is no more than 15% of the quantity specified in the order the Buyer shall have been delivered and such Goods shall be entered in the Seller in its absolute discretion and without giving prior notice to the Buyer at the expiration of 3 months to sell or otherwise dispose of Goods kept in storage as provided in Condition 8.4

10.4 The Seller’s rights contained in Condition 17 (but not the Buyer’s rights) shall continue beyond the discharge of the parties’ primary obligations under the Contract consequent upon its termination

11 INSPECTION AND CLAIMS FOR DEFECTS

11.1 The Goods are of a highly specialised nature and must be treated with the utmost care. It is essential that the Buyer checks that they are suitable for the purpose for which they are intended. Lady dates shall not constitute a breach of Contract and the Seller shall not in any circumstances be responsible for any direct or consequential loss or damage of any kind whatever resulting therefrom. The Seller may wholly or partly suspend deliveries of Goods or Services under the Contract if it shall accept late delivery of such Goods or Services unless the Buyer has cancelled the Contract in accordance with the provisions of Condition 10.3

11.2 The Buyer shall inspect the Goods and carry out tests to ensure the Goods conform with the description of the Goods or Services in the Buyer’s orders within 7 days of delivery and whether or not the Buyer carries out such inspection to inspect and test for non-conformity to description or partial loss or damage to Goods will be accepted by the Seller unless:-

11.2.1 if the Buyer is notified in writing by the Buyer to the Seller within 10 days after the Date of Delivery (in the case of partial loss, damage, non-conforming or defective Goods or Services) or 14 days after the date of the invoice (in the case of non-delivery);

11.2.2 the Goods in respect of which a claim is made together with all the relevant papers and documents as evidence received at the Seller, if it is made in writing as received for a period of 35 days from notification of any such claim and the Buyer permits the Seller or its servants or agents full and free right of access to inspect the Goods and investigate the claim; and

11.2.3 if the Buyer fails to give the appropriate notice as specified in Condition 11.2.1, the Buyer’s claim is deemed to have been waived and will be absolutely barred

11.3 It is in all cases the responsibility of the Buyer to ensure by testing or otherwise that the Goods are fit for the purposes for which the Buyer requires them in the conditions in which they will be used. The Buyer acknowledges that the Seller shall be under no liability of any description to the Buyer if the Goods prove to be unsuitable for whatever reason for applications or of use for which the Seller, at the request of the Buyer, have given in good faith technical or other advice in relation to the proposed application or use of the Goods and the Buyer shall indemnify and keep indemnified the Seller in full against any and all claims or actions whatever by whomever brought or however arising out of or connected with the application or use of the Goods.

11.4 Section 3 Sale and Supply of Goods Act 1994 shall not apply.

12 WARRANTY

12.1 In substitution for all and any other rights which the Buyer might or would have had but for these Conditions and subject to Condition 11,
14. The Seller will have the right to maintain an action against the Buyer if a claim arising from the provision of Incoterms is made.

16. Where the Goods are supplied for export from the United Kingdom then unless otherwise agreed in writing between the Buyer and the Seller the Seller shall have the right to sell the Goods when the property is to pass to the Buyer at the time of delivery to the Buyer's premises or to the Buyer's agent or carrier.

17. Buyer's Warranties

17.1 The Buyer warrants to the Seller that:

17.1.1 the Buyer will install, operate or otherwise use or store the Goods strictly in accordance with the Seller's recommendations as to the installation, operation, use or storage of the Goods; and

17.1.2 any collection vehicle, container, ship or other means of transport provided by the Buyer or any agent of the Buyer will comply with all relevant legislation and regulations relating to health and safety requirements;

17.1.3 the storage and transport facilities and all parts thereof and all equipment used in connection therewith is suitable for storage (both short term and long term) and transport of the Goods and complies with any statute, regulation, by law or other rule having the force of law and relating to the storage of goods of the nature of the Goods; and

17.1.4 the Buyer will ensure that the Goods are stored in conditions appropriate to goods of that nature and will comply with any recommendations as to the storage of Goods notified to it by the Seller from time to time; and

17.2 The Buyer shall indemnify and keep indemnified the Seller in full for any loss or damage whatsoever which the Seller may incur if such Goods do not comply with such safety regulations.

18. Severance

18.1 If at any time any one or more of the provisions or part thereof of these Conditions becomes or is invalid, illegal or unenforceable in any respect under any law or is held by a court to be invalid, illegal or unenforceable, the validity and enforceability of the remaining provisions hereof and the remainder of such provision shall not in any way be affected or impaired thereby.

19. Jurisdiction

19.1 These Conditions and each and every Contract made pursuant to them shall be governed by and construed in all respects in accordance with the laws of England and the Seller and the Buyer hereby agree to submit to the non-exclusive jurisdiction of the English Courts.

20. Notices

20.1 Any notice required or permitted to be given by either party to the other under these Conditions shall be in writing addressed to the other party at its registered office or principal place of business or such other address as may at the relevant time have been notified pursuant to this provision to the party giving notice.

20.2 Any notice given pursuant to clause 20.1 shall be deemed to have been served:

20.2.1 if delivered by hand, on the first Business Day following delivery;

20.2.2 if sent by post, on the third Business Day after posting if the address of the recipient is in the country of despatch; otherwise on the seventh Business Day after posting;

20.3 if transmitted by fax or similar means, on the first Business Day following successful transmission.

20.4 In this Condition 20, "Business Day" shall mean any day other than Saturday, Sunday or any other day which is a public holiday in the place at which the notice is sent or to which such notice is despatched.

21. Waiver

21.1 The Seller may give a waiver or consent in writing or by any other means and from time to time in connection with the provisions of Incoterms or any other provision of these Conditions or any other rule having the force of law and relating to the storage of Goods, notwithstanding that the risk in the same shall pass to the Buyer.

21.2.3 The Buyer shall be deemed to have satisfied itself that such Goods comply with the safety regulations of any country or state in which the Goods are to be used outside the United Kingdom and the Seller shall indemnify and keep indemnified the Seller in full for any loss or damage whatsoever which the Seller may incur if such Goods do not comply with such safety regulations.

21.3 The Goods shall not be used in any country other than that for which the Goods are to be delivered unless otherwise agreed in writing between the Buyer and the Seller.

21.4 The Buyer shall indemnify and keep indemnified the Seller in full for any loss or damage whatsoever which the Seller may incur if such Goods do not comply with such safety regulations.
21.1 No waiver by the Seller of any breach of any provision of the Contract by the Buyer shall be considered as a waiver of any subsequent breach of the same or any other provision and the Seller shall not be prejudiced by any forbearance or indulgence granted by it to the Buyer.
Aluminum was discovered by Hans Oersted in Copenhagen, Denmark in 1825.

Aluminum is a silvery white reactive metal which is usually covered by a tenacious oxide coating. This renders it inert to acids, but it is attacked by alkalies. It is the most common metallic element in the earth’s crust (82000 ppm) and is extracted from the hydrated oxide, Bauxite, by electrolysis of the oxide dissolved in molten sodium hexafluorosilicate (cryolite). The metal has good thermal properties and is malleable and ductile. Aluminum and its alloys are widely used for various applications including aircraft assemblies and engine parts.

**Atomic Properties**
- Atomic number: 13
- Atomic radius – Goldschmidt: 0.143 nm
- Atomic weight: 26.98154 amu
- Crystal structure: Face centred cubic
- Electronic structure: Ne 3s
- Natural isotope distribution: Mass No. %
  - 27: 100
- Valences shown: 3
- Ionization potential: No. eV
  - 1: 5.99
  - 2: 18.8
  - 3: 28.4
  - 4: 120
  - 5: 154
  - 6: 190
- Thermo-electric work function: 4.2 eV
- Atomic weight: 26.98154 amu
- Atomic number: 13
- Atomic radius – Goldschmidt: 0.143 nm

**Physical Properties**
- Density @20°C: 2.70 g cm⁻³
- Thermal conductivity @0-100°C: 237 W m⁻¹ K⁻¹
- Conductivity @20°C: 0.0045 K⁻¹
- Latent heat of fusion: 10800 J g⁻¹
- Latent heat of evaporation: 100°C
- Melting point: 660.4 °C
- Boiling point: 2467 °C
- Melting point: 2467 °C
- Density: 2.70 g cm⁻³

**Chemical Properties**
- No. eV
  - 1: 5.99
  - 2: 18.8
  - 3: 28.4
  - 4: 120
  - 5: 154
  - 6: 190

**Electrical Properties**
- Electrical resistivity @20°C: 2.67 μΩcm
- Temperature coefficient @0-100°C: 0.0045 K⁻¹
- Superconductivity critical temperature: 1.175 K
- Thermal emf against Pt (cold 0°C - hot 100°C): +0.42 mV
- Coefficient of thermal expansion @0-100°C: 23.5 x 10⁻⁶ K⁻¹

**Mechanical Properties**
- Tensile modulus: 70.6 GPa
- Tensile modulus: 75.2 GPa
- Ionic radius - Goldschmidt: 0.143 nm

**Mechanical Properties**
- Bulk modulus: 27 100
- Tensile modulus: 50-90
- Tensile strength: 130-195 MPa
- Yield strength: 10-35
- Thermal conductivity: 237 W m⁻¹ K⁻¹
- Conductivity: 0.0045 K⁻¹

**Microleaf**
These items are supplied on a temporary support for ease of handling and full removal instructions will be supplied with each delivery.

**AL004915**
- Thinness: 0.15 μm
- Purity: 99.999%
- Support: Removable
- Specific density: 41.28 g cm⁻³
- Web Code: 101-620-660
- Disk diam. 1 disk 2 disks 5 disks
  - 10 mm: USD 926.00 USD 1336.00 USD 2563.00
  - 25 mm: USD 1472.00 USD 2154.00 USD 4200.00
- Material condition: Soft
- Polycrystalline

**AL004925**
- Thinness: 0.25 μm
- Purity: 99.999%
- Support: Removable
- Specific density: 68.98 g cm⁻³
- Web Code: 284-358-448
- Disk diam. 1 disk 2 disks 5 disks
  - 10 mm: USD 579.00 USD 814.00 USD 1520.00
  - 25 mm: USD 892.00 USD 1284.00 USD 2461.00
- Material condition: Soft
- Polycrystalline

**AL004950**
- Thinness: 0.5 μm
- Purity: 99.999%
- Support: Removable
- Specific density: 120.6 μg cm⁻²
- Web Code: 539-894-973
- Disk diam. 1 disk 2 disks 5 disks
  - 10 mm: USD 620.00 USD 875.00 USD 1643.00
  - 25 mm: USD 961.00 USD 1387.00 USD 2666.00
- Material condition: Soft
- Polycrystalline

**AL004990**
- Thinness: 1.0 μm
- Purity: 99.999%
- Support: Removable
- Specific density: 269.9 μg cm⁻²
- Web Code: 703-735-552
- Disk diam. 1 disk 2 disks 5 disks
  - 10 mm: USD 722.00 USD 1029.00 USD 1949.00
  - 25 mm: USD 1131.00 USD 1643.00 USD 3177.00
- Material condition: Soft
- Polycrystalline

These items are normally made to order for delivery within 4-5 weeks. This foil has a limited shelf-life and should be used within 7-10 days of receipt. Returns will not be accepted unless we are notified within 14 days of our invoice date.
Carbon has been known since prehistoric times. Carbon occurs naturally in two allotropic forms, namely graphite and diamond; the discovery in 1965 of fullerences has increased the number of allotropic forms of this element. Its abundance in the Earth’s crust is 480 ppm. The study of carbon and its organic compounds is the basis of organic chemistry.

The applications for carbon are many and include its use as an alloying element with iron in the manufacture of steel, its use as brushes in electrical generators and motors, the use of colloidal graphite or carbon to coat surfaces (e.g., glass), in electrical assemblies to absorb microwaves and inhibit photoelectrons and secondary electrons, and the use of high purity carbon (graphite) in nuclear reactors to moderate neutrons.

Diamond has unique properties, being one of the hardest materials known and with excellent corrosion resistance and thermal transfer. Industrial diamond is used in rock drilling equipment and abrasive materials. CVD diamond has been the subject of extensive research and development over the past several years and applications for this material are only just being realized.

Carbon is a fundamental part of all life, it being a prime constituent of DNA. On average, the human body contains approximately 16kg of carbon in one form or another.

### Atomic Properties
- **Atomic number**: 6
- **Atomic radius - Goldschmidt**: 0.077 nm
- **Atomic weight**: 12.011 amu
- **Crystal structure**: Hexagonal/Diamond
- **Electronic structure**: He 2s 2p 2
- **Photo-electric work function**: 4.8 eV
- **Melting point**: 3650°C
- **Boiling point**: 5000°C
- **Valences shown**: 2, 3, 4
- **Thermal neutron absorption cross-section**: 0.0034 Barns
- **Thermal emf against Pt (cold 0°C - hot 100°C)**: +0.70 mV
- **Photo-electric work function**: 4.8 eV
- **Electrical resistivity @0°C**: 1375 Ohmcm

### Physical Properties
- **Electronic structure**: He 2s
- **Electronic properties**: Graphite, Diamond
- **Thermal conductivity @0-100°C**: 80-240 W m⁻¹ K⁻¹
- **Thermal conductivity @0-100°C**: 72 J K⁻¹ kg⁻¹

### Mechanical Properties
- **Material condition**: Graphite
- **Tensile modulus**: 4.8 GPa
- **Coefficient of thermal expansion @0°C - 100°C**: 0.6-4.3 x10⁻⁶
- **Heat of fusion**: 3.6 x10⁻⁶

### Electrical Properties
- **Conductivity**: 0.5 µΩ cm⁻¹
- **Specific heat**: 712 J K⁻¹ kg⁻¹

### Thermal Properties
- **Boiling point**: 5000°C
- **Density @20°C**: 2.25 g cm⁻³
- **Density @0°C**: 2.36 g cm⁻³
- **Density @20°C**: 2.25 g cm⁻³

### Microleaf

This Microleaf comes on a temporary Glass support, full instructions for removal supplied with each order. The density of the Carbon Microleaf is in the range 1.84-2.0g cm⁻³. These foils are manufactured according to the surface density and the figures quoted for thinness are nominal only.

### C 004905
- **Thinness**: 0.0025µm
- **Purity**: 99.997%
- **Specific density**: 0.5µg cm⁻²
- **Support**: Temporary Glass

### C 004910
- **Thinness**: 0.025µm
- **Purity**: 99.997%
- **Specific density**: 5µg cm⁻²
- **Support**: Temporary Glass

### C 004920
- **Thinness**: 0.050µm
- **Purity**: 99.997%
- **Specific density**: 10µg cm⁻²
- **Support**: Temporary Glass

### C 004940
- **Thinness**: 0.25µm
- **Purity**: 99.997%
- **Specific density**: 50µg cm⁻²
- **Support**: Temporary Glass

Typical Analysis:
- Al 0.2, B 1, Ca 0.05, Cu 0.01, Fe 0.2, Mg 0.05, Na 0.02, Si 1.

These foils are manufactured according to the surface density and the figures quoted for thinness are nominal only.
### Carbon

#### Microleaf

<table>
<thead>
<tr>
<th>Size</th>
<th>Web Code</th>
<th>Quantity</th>
<th>1pc</th>
<th>2pcs</th>
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<td>0.50µm</td>
<td>049-680-965</td>
<td>25 x 70 mm</td>
<td>USD 839.00</td>
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Typical Analysis: Al 0.2, B 1, Ca 0.05, Cu 0.01, Fe 0.2, Mg 0.05, Na 0.02, Si 1.

This item is normally made to order for delivery within 4-5 weeks. This foil has a limited shelf-life and should be used within 7-10 days of receipt. Returns will not be accepted unless we are notified within 14 days of our invoice date.

### Gold

This metal has been known since prehistoric times. Gold is a soft metal with a characteristic yellow color. It is the most malleable and ductile of any element. It is unaffected by air, water, alkalis and acids, with the exception of "aqua regia", HNO₃/HCl. The fact that it is chemically unreactive means that it is often found in its natural state. It is a good thermal and electrical conductor and has excellent reflective properties to both light and infrared. It has an abundance in the earth’s crust of 0.0011 ppm.

Most of the metal is retained for use as bullion reserves, but some is used within the electronics and jewellery industries, where it is frequently alloyed with other elements to improve the mechanical properties of the metal (e.g., copper and silver). Other uses for the metal are as a heat reflecting coating for glass as well as as a decorative medium.
**Gold**

**Microleaf**

These items are supplied on a temporary support for ease of handling and full removal instructions will be supplied with each delivery.

<table>
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<tr>
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<th>Disk diam.</th>
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<td>AU004925</td>
<td>10 mm</td>
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Typical Analysis: Starting Material: Ag 3, Ca < 1, Cd < 1, Cu 1, Fe < 1, Mg < 1, Pd 1, Si 1.

This item is normally made to order for delivery within 4-5 weeks. This foil has a limited shelf-life and should be used within 7-10 days of receipt. Returns will not be accepted unless we are notified within 14 days of our invoice date.

**AU004950**

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Typical Analysis: Starting Material: Ag 3, Ca < 1, Cd < 1, Cu 1, Fe < 1, Mg < 1, Pd 1, Si 1.

This item is normally made to order for delivery within 4-5 weeks. This foil has a limited shelf-life and should be used within 7-10 days of receipt. Returns will not be accepted unless we are notified within 14 days of our invoice date.

**AU004990**

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<td>USD 728.00</td>
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Typical Analysis: Starting Material: Ag 3, Ca < 1, Cd < 1, Cu 1, Fe < 1, Mg < 1, Pd 1, Si 1.

This item is normally made to order for delivery within 4-5 weeks. This foil has a limited shelf-life and should be used within 7-10 days of receipt. Returns will not be accepted unless we are notified within 14 days of our invoice date.
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