PI-KEM

CRYSTAL SUBSTRATES

Product Overview

A BOND WORTH FORMING

WE ENABLE INNOVATION

For over 30 years we've been enabling you to accelerate your research and development, proudly partnering with the most innovative minds in the science and technology sectors.

We're purpose designed to support your science and technology innovation, and take your ideas from lab-based concepts to full-scale production.

With our capabilities and extensive expertise we're the partner of choice for custom manufacturing solutions and niche product sourcing through our trusted network of UK and international suppliers.

Specialising in the following areas:

- **Energy Research**
- **Hydrogen Technology**
- **Photonics + Optoelectronics**
- **Thin Films + Nanotech**
- **Materials Processing + Testing**
- **RF Shielding**
- **Electroforming**
- **Specialist Metallic Coatings**

Accelerate your journey. **We are PI-KEM.**

MICRO-INFO

- 30+ years supplying advanced materials and equipment
- Custom manufactured components
- Niche product sourcing
- Comprehensive range of standard stock products and consumables
- Call off purchase options
- Support from an expert scientific team
- Low minimum order quantity
- UK, European & global delivery

We offer a wide range of advanced materials and equipment which are available as standard or custom manufacture.

Within this catalogue are our most requested lines, however we welcome any enquiry for other specifications.

CONTENTS

Crystal Substrates

Our Partners

We distribute on behalf of leading manufacturers of advanced materials & equipment

Our single crystal supplier SurfaceNet was founded in 2003 by Dipl-Ing. Peter Droste, who has over 40 years of experience in crystal growth and crystal processing.

SurfaceNet can provide a wide range of substrates, from simple sapphire and quartz to specially grown crystals with custom dopants and orientations. With constant equipment updates, they are specialists in producing unique and never-before-seen crystals.

Their production facility extends over 720 m^2 and enables them to manage every aspect of substrate manufacturing, from growing crystals to orientating, cutting, polishing and packaging substrates.

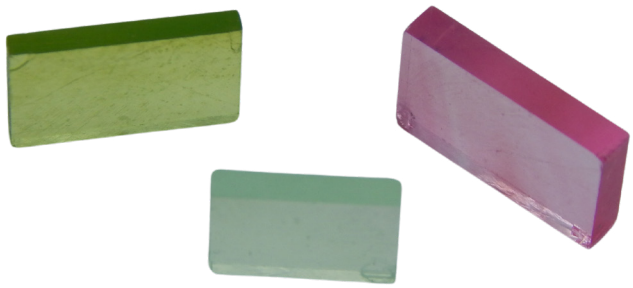
In addition to crystal products, SurfaceNet also manufacture speciality chemicals and targets according to customer requirements.

As SurfaceNet's UK & Ireland Distributor, PI-KEM has been a trusted partner for over 20 years.

Their extensive experience in crystal growth, production, and manufacturing, allows them to offer a wide range of high-quality single-crystal products for the electronics, energy and optics sector.

If you have any upcoming substrate requirements or would like more information, please contact our expert team.

CRYSTAL SUBSTRATES



PI-KEM offer a range of single crystals and substrates, both standard and custom grown.

Single crystals can be supplied as the following:

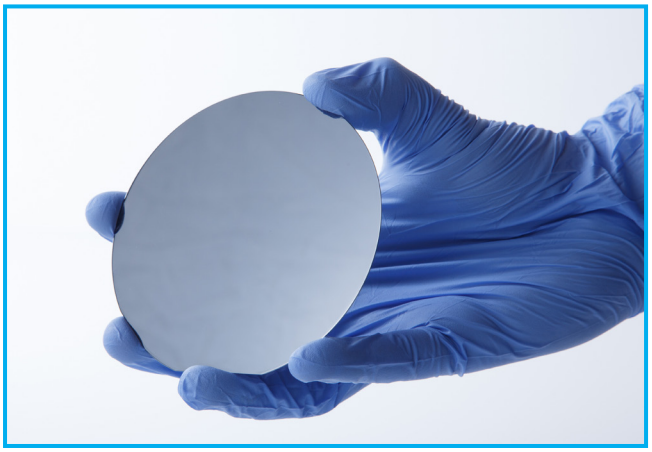
- **Custom sizes and shapes**
- **Standard wafer sizes, eg. 2", 3" or substrates (sizes 5mm x 5mm or 10mm x 10mm)**
- **Standard orientations, as well as custom mis-cuts and tolerances**
- **Single or double side polished surface finish, to standard or custom surface roughnesses**

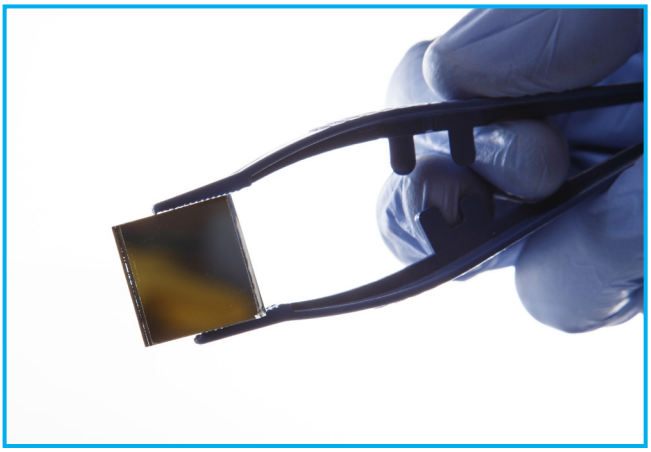
We welcome any enquiry for other specifications

Materials Available:
- Metal Single Crystals
- Oxides
- Titanates
- Niobates
- Gallates
- Aluminates
- Doped Crystals
- Bi-crystals

Specifications Available:
- Purity
- Doped or undoped
- Orientation

Structure:
- As cut
- Polished
- To required Orientation and Size
- Vicinal Substrates
- Boules, wafers, tiles, prisms, optical components and rods





Single crystal substrates are fundamental materials for semiconductor and electronic devices due to their unique physical and electrical properties.

These include:

- **Monocrystalline structure:** Give uniform crystal orientation with no grain boundaries
- **High electron mobility:** Allows faster signal processing and device operation
- **High mechanical strength:** Less likely to deform or fracture
- **Enhanced thermal conductivity:** Dissipate heat efficiently
- **Optical Transparency:** In materials including sapphire and silicon carbide making them suitable for use in optical devices and sensors
- **Uniform doping characteristics**

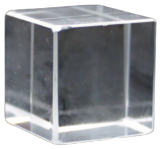
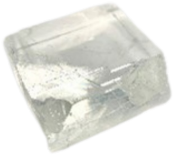
They serve as the foundation upon which electronic circuits are built, enabling the development of high-performance devices with enhanced capabilities.

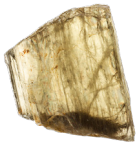
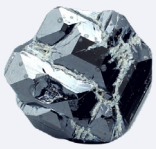
Examples of applications are:
- Integrated circuits
- Power electronics
- Optical devices
- Sensors and detectors
- High-frequency devices

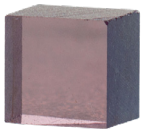
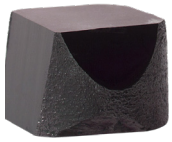
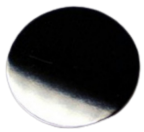
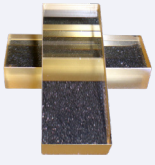
PI-KEM offer a range of substrate and wafer storage options:
- Individual wafer carriers (sizes available 2" - 8")
- Cassettes (sizes available 2" - 8")
- IC trays
- Membrane boxes

CRYSTAL SUBSTRATES

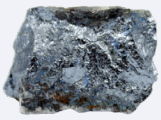
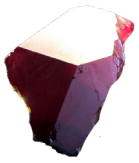
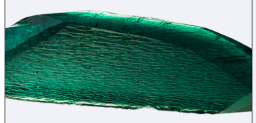
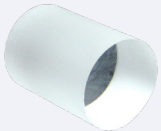
Here are a selection of the materials our substrates can be produced from.

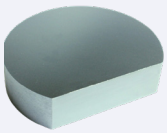
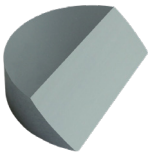
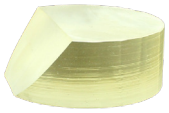
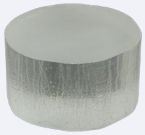
	Substrate	Formula
	Alexandrite	$BeAl_2O_4:Cr^{3}+$
	Aluminium Oxide (Sapphire)	Al_2O_3
	Aluminium Oxide Magnesium Oxide (Spinell)	1 Al_2O_3 * 1 MgO or 3,5 Al_2O_3*1 MgO
	Aluminium Oxide (Chromium Doped)	Al_2O_3:Cr
	Aluminium Oxide (Chromium vanadium Doped)	Al_2O_3:CrV
	Aluminium Oxide Iron Chromium	Al_2O_3:FeCr
	Aluminium Oxide Iron Doped	Al_2O_3:Cr
	Aluminium Oxide Titanium Doped	Al_2O_3:Ti

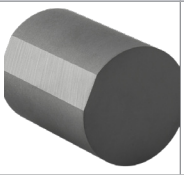
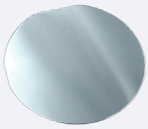
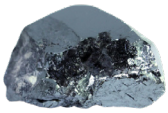
	Substrate	Formula
	Aluminium Oxy Hydroxide	AlO(OH)
	Anatase crystals	TiO_2
	Barium Fluoride	BaF_2
	Barium Titanate	$BaTiO_3$
	Barium Titanate Ce Doped	$BaTiO_3$:Ce
	Barium Titanate Nb Dobed 1500ppm	$BaTiO_3$:Nb - 1500ppm
	Barium Zirconate	$BaZrO_3$
	Bismuth Vanadate	$BiVaO_4$

	Substrate	Formula
	Bismuth Ferrite	$BiFeO_3$
	Beryllium Hexa-Aluminate	$BeAl_6O_{10}:Cr^{3}+$
	Beryllium Aluminate (Chrysoberyll)	$BeAl_2O_4$
	Beta Barium Borate	ß-BaB_2O_4 or BBO
	Bismuth Silicate	BSO
	Bismuth Germanate	BGO
	Cadmium Selenide	CdSe
	Cadmium Sulfide	CdS
	Cadmium Telluride	CdTe
	Cadmium Tungstate	$CdWO_4$

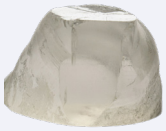
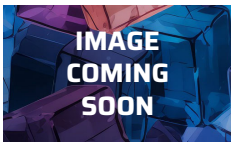
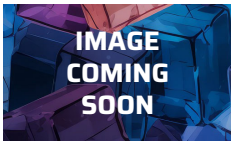
	Substrate	Formula
	Calcium Titanate	$CaTiO_3$
	Calcium Tungstate	$CaWO_4$
	Calcium Tungstate Er Doped	$CaWO_4 : Er_4$
	Calcium Tungstate Pr Doped	$CaWO_4 : Pr$
	Calcium Carbonate Calcite Type	$CaCO_3$ (Calcite)
	Calcium Carbonate Aragonite type	$CaCO_3$ (Aragonite)
	Calcium Fluoride	CaF_2
	Calcium Neodymium Aluminate	$CaNdAlO_4$
	Cassiterite	SnO_2
	Cerium Oxide	CeO_2

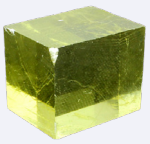
	Substrate	Formula
	Cerium Oxide Calcium Doped	CeO_2:Ca
	Cobalt Aluminate	$CoAl_2O_4$
	Cobalt Carbonate (Spherocobalite)	$CoCO_3$
	Cobalt Oxide	CoO
	Cobalt Titanate	$CoTiO_3$ / Co_2TiO_4
	Copper Sulphide	Cu_2S
	Copper Oxide	Cu_2O
	Chrome Oxide	Cr_2O_3
	Dysprosium Scandate	$DyScO_3$
	Forsterite	Mg_2SiO_4

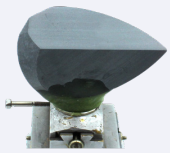
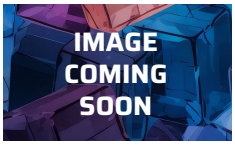
	Substrate	Formula
	Forsterite Chromium Doped	Mg_2SiO_4 : Cr
	Gadolinium Scandate	$GdScO_3$
	Gallium Antimonide	GaSb
	Gallium Arsenide (Semi-conducting HB/VB)	GaAs
	Gallium Arsenide (Semi-insulating VB)	GaAs (VB)
	Gallium Gadolinium Garnet	GGG
	Gallium Gadolinium Garnet substituted	SGGG
	Gallium Oxide	Ga_2O_3
	Gallium Phosphide	GaP
	Gallium Scandium Gadolinium Garnet	GSGG

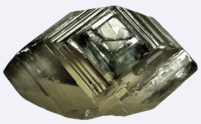
	Substrate	Formula
	Germanium	Ge
	Germanium Antimony Doped	Ge:Sb
	Germanium Gallium Doped	Ge:Ga
	Indium Arsenide	InAs
	Indium Phosphide	InP
	Iron Carbonate	$FeCO_3$
	Iron Oxide (Hematite)	Fe_2O_3
	Iron Oxide (Magnetite)	Fe_3O_4
	Iron Hydroxy Oxide	FeOOH
	Iron Sulphide Pyrite type	FeS_2 (Pyrite)

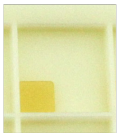
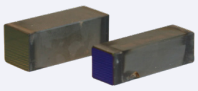
	Substrate	Formula
	Iron Titanate	$FeTiO_3$
	Iron Tungstate	$FeWO_4$
	Indium Antimonide	InSb
	Langasite	$La_3Ga_5SiO_{14}$ (LGS)
	Langatate	$La_3Ga_{5.5}Ta_{0.5}O_{14}$ (LGT)
	Lanthanum Aluminate	$LaAlO_3$
	Lanthanum Strontium Aluminium Tantalate	LSAT
	Lead Molybdate	$PbMoO_4$
	Lead Sulphate	Pb_2SO_4
	Lithium Aluminium Oxide	$LiAlO_2$

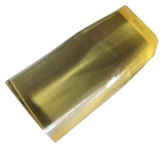
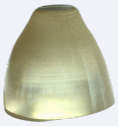
	Substrate	Formula
	Lithium Ferrite	$LiFe_5O_8$
	Lithium Fluoride	LiF
	Lithium Gallate	$LiGaO_2$
	Lithium Iodate	$LiIO_3$
	Lithium Niobate	$LiNbO_3$
	Lithium Tantalate	$LiTaO_3$
	Lithium Triborate	LiB_3O_5 LBO
	Magnesium Fluoride	MgO
	Magnesium Oxide Bor Doped 200ppm	MgO:B 200ppm
	Magnesium Oxide Chromium Doped 150-15100ppm	MgO:Cr 150-15100ppm

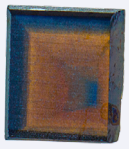
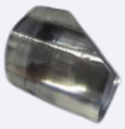
	Substrate	Formula
	Magnesium Oxide Chromium Doped 150-15100ppm	MgO:Co 1200-9900ppm
	Magnesium Oxide Gadolinium Doped 200ppm	MgO:Gd 200ppm
	Magnesium Oxide Iron Doped 300-12900ppm	MgO:Fe 300-12900ppm
	Magnesium Oxide Iron / Chromium Doped 500-3500ppm	MgO:Fe/Cr 500-300ppm
	Magnesium Oxide Iron / Vanadium Doped 150-300ppm	MgO:Fe/V 150-300ppm
	Magnesium Oxide Manganese Doped 840-3100ppm	MgO:Mn 840-3100ppm
	Magnesium Oxide Nickel Doped 370-5000ppm	MgO:Ni 370-5000ppm
	Magnesium Oxide Scandium Doped 800ppm	MgO:Sc 800ppm
	Magnesium Oxide Titanium Doped 3000ppm	MgO:Ti 3000ppm
	Magnesium Oxide Vanadium Doped 450-15000ppm	MgO:V 450-15000ppm

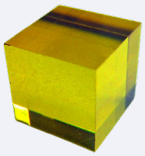
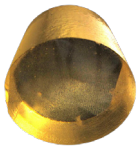
	Substrate	Formula
	Manganese Aluminate	$MnAl_2O_4$
	Manganese Carbonate (Rhdochrosite)	$MnCO_3$
	Manganese Oxide	MnO
	Neodymium Doped Yttrium Aluminium Garnet	Nd:YAG
	Neodymium Doped Yttrium Orthovanadate	$Nd:YVO_4$
	Neodymium Aluminate	$NdAlO_3$
	Neodymium Calcium Aluminate	$NdCaAlO_4$
	Neodymium Gallate	$NdGaO_3$
	Neodymium Gadolinium Garnet	NGG
	Neodymium Scandate	$NdScO_3$

	Substrate	Formula
	Nickel Aluminate	$NiAl_2O_4$
	Nickel Oxide	NiO
	PMN-PT	
	Potassium Bromide	KBr
	Potassium Chloride	KCl
	Potassium Dihydrogen Phosphate	KDP, DKDP or KD*P
	Potassium Niobate	$KNbO_3$
	Potassium Tantalate	$KTaO_3$
	Quartz	SiO_2
	Potassium Titanyl Phosphate	$KTiOPO_4$ KTP

	Substrate	Formula
	Samarium Scandate	$SmScO_3$
	Scandium Gallium Garnet	SCGG
	Scandium Yttrium Gallium Garnet	SYGG
	Silicon	Si
	Silicon Carbide	SiC 4 H
	Silicon Carbide	SiC 6 H
	Silicon Dioxide	SiO_2
	Silver Gallium Selenite	$AgGaSe_2$
	Silver Gallium Sulphide	$AgGaS_2$
	Sodium Chloride	NaCl

	Substrate	Formula
	Sodium Fluoride	NaF
	Spinell (Co Doped)	$1MgO_3Al_2O_3:Co$ $MgAl_2O_4:Co_2+$
	Strontium Lanthanum Aluminate	$SrLaAlO_4$
	Strontium Lanthanum Gallate	$SrLaGaO_4$
	Strontium Titanate	$SrTiO_3$
	Strontium Calcium Titanate	$Sr_xCa_yTiO_3$
	Tellurium Oxide	TeO_2
	Terbium Manganate	$TbMnO_3$
	Terbium Gallium Garnet	TGG
	Terbium Scandate	$TbScO_3$

	Substrate	Formula
	Titanium Dioxide Rutile type	TiO_2 (Rutile)
	Titanium Dioxide Anatase type	TiO_2 (Anatase)
	Titanium Dioxide Brookite type	TiO_2 (Brookite)
	Titanium Doped Sapphire	Ti:Sapphire
	Yttrium Aluminium Garnet Chromium Doped	Cr_4+:YAG
	Ytterbium Doped Yttrium Aluminium Garnet	Yd:YAG
	Ytterbium Gallium Garnet	YGG
	Yttrium Aluminium Garnet	$Y_3Al_5O_{12}$ YAG
	Yttrium Aluminium Perovskitet	$YAlO_3$
	Yttrium Gallium Gadolinium Garnet	YGGG

	Substrate	Formula
	Yttrium Iron Garnet	YIG
	Yttrium Orthosilicate	Y_2SiO_5
	Yttrium Vanadate	YVO_4
	Zinc Aluminate Gahnite	$ZnAl_2O_4$
	Zinc Oxide	ZnO
	Zinc Selenide	ZnSe
	Zinc Sulphide Spahlerite type	ZnS (Spahlerite)
	Zinc Sulphide Wurzit type	ZnS (Wurzit)
	Zinc Telluride	ZnTe
	Yttria Stabilised Zirconia (YSZ)	ZrO : 9,5 mol% Y_2O_3

NOTES

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