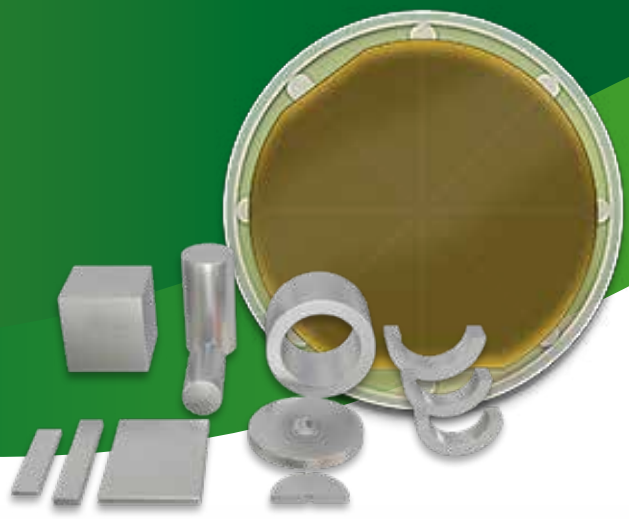
Materials

Sensors, magnets and YIG



Magneto-optical sensors

The highly sensitive magneto-optical sensors form the basis for the visualization of magnetic fields for quality control.

Physical background

The magneto-optic principle is based on the Faraday effect. It describes the rotation of the polarization plane of linearly polarized light when passing through a transparent medium. With a closer look, linearly polarized light consists of superposition of a left and a right-circularly polarized wave with same frequency and phase. When light is passing a magneto-optical medium on which a magnetic field is applied parallel to the direction of the light, it splits into two oppositely rotating circularly polarized waves. For the two partial waves, it causes phase shifting, because they have different refractive indices and different speeds. Their frequency remains the same. This shift results in the rotation of the polarization plane. The different angles of rotation depending on the local magnetic field strength result in contrast-differences which can be evaluated visually. Thus, a direct real-time visualization of quasi-static magnetic fields over the entire sensor surface is achieved..

Sensor type A

Quality inspection & geometric assessment of:

- Magnetic encoders
- Electrical steel sheets
- Forensic security features
- Residual magnetism

Sensor type B/C

Surface inspection and quantitative analysis:

- of permanent magnets
- of magnetic encoders with strong magnetization
- of polymer-bonded magnets
- of magnetic particles in composites
- in superconductor studies

Sensor type D

Investigation and visualization of:

- Soft magnetics
- magnetic inks in banknotes
- magnetic inks in documents

Sensor type E

Measurement of:

- Permanent magnets up to 1 T.
- Multipole magnets with high fields

Your partner for magnetism and lead testing

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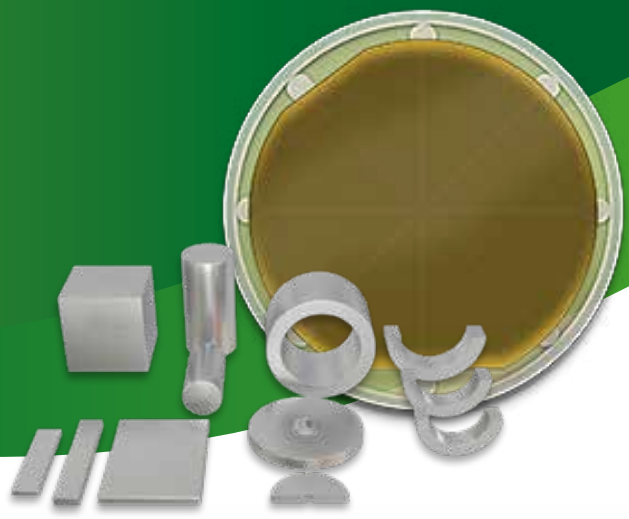


Custom made permanent magnets

Matesy supplies permanent magnets as well as custom-made special magnets with an exact direction of magnetization for the highest quality requirements.

NdFeB, SmCo, Ferrit, AlNiCo magnets

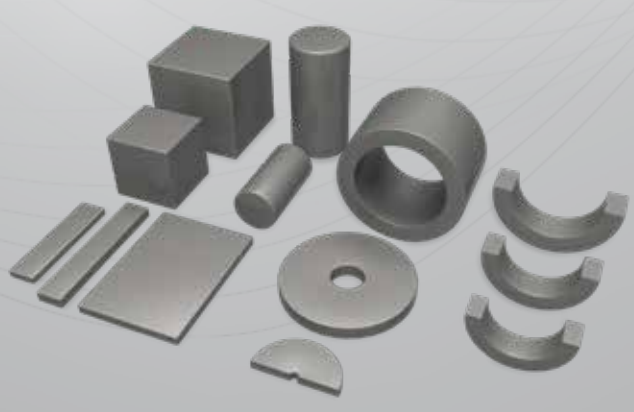
As a „premium magnets“ we call magnets which meet the highest quality and conformity requirements. Because of longstanding cooperations to suppliers and a perfectly balanced internal quality management, consisting of measurements with the CMOS-MagView and the M-axis, we can provide you magnets which exactly match your specified parameters. For all types of magnets: NdFeB, SmCo, AlNiCo and ferrites.

Properties

- The premium magnet is characterized by particularly good magnetic properties.
- In particular, its magnetization lies exactly in the specified direction.
- The open remanence is known to within 1%.
- This allows the properties of magnet systems to be determined particularly well with these magnets.
- The magnets are either selected from a batch or, if the yield is low, produced directly for the customer.
- The measurement is carried out with our M-axis, the measuring system for open remanence and angle of magnetization of hard magnetic materials.
- Further classifications of the magnets are realized with the cmos-magview..

Technical information

- Magnetic moment: 0.01 Am² - 10 Am²
- Open remanence: ± 1%
- Magnetic angle: up to ± 0.1 °
- North-south effect if required



You can find exact specifications on the product page:

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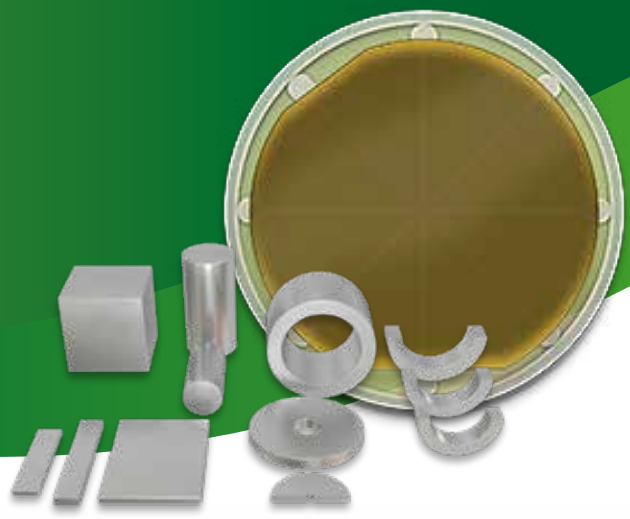

YIG single crystal and iron garnet balls

(Iron garnet balls with an extremely high quality factor)

The single crystalline material is usually grown from flux melts. The preparation of optically polished spheres with diameters of around 0.3 mm is based on pieces in the shape of cubes (upper picture), which are sliced and diced from the single crystals. Finally, the cubes are shaped into spheres (lower picture) and their surfaces are polished to a high degree of perfection. The saturation polarization 4pMs of the spheres is dependent on the substitution level of diamagnetic ions and can be determined as the distance between the (210) Walker and the homogeneous precession mode (left graph). Typical values of the full width of the half maximum of the ferromagnetic resonance ΔH are less than 1 Oe (right graph).Typical half-widths for the ferromagnetic resonance line width ΔH are less than 1 Oe.

Application

YIG single crystals are most commonly used for the construction of electronically tunable oscillators (YIG oscillator) and filters. For the set-up of such components magnetically tunable resonators are being deployed. As major frequency-determining component YIG single crystals are applied.

YIG films / layers (monocrystalline yttrium-iron-garnet layers)

Epitaxial YIG films can be used for example for electronically tunable delay lines and phase shifters, which require film thicknesses in the micrometer range. Further fields of application could be integrated non-reciprocal components such as magneto-optical isolators and circulators as well as Bragg cell modulators for integrated optics. At present, internationally efforts are being made to develop these isolator films as a promising base material for spin wave devices (YIG magnonics) with micro- and nanostructures (nano-magnonics) in information processing and to link them with electronic and spin electronic elements via suitable interfaces.

YIG, Wafer Level 1“ & 3“

- YIG on GGG substrate:
- epitaxially grown monocrystalline yttrium iron garnet
- Thicknesses available:
- 100nm, 200nm, 1µm - 20µm
- Surface roughness (RMS): <0.5nm
- FMR line width (FWHM):
- 2Oe at 10GHz
- Thickness deviation (80%, central): <1%
- Polishing: coated on one side
- (both sides possible on request) • GGG substrate thickness: 0.5 ± 0.05mm
- Crystallographic orientation: (111)

The miniaturization of these components requires film thicknesses in the sub-micrometer range. Epitaxial films are fabricated by liquid phase epitaxy technique (LPE) from high temperature solutions and single crystals by single crystal growth techniques. The LPE growth technology enables to fabricate epitaxial yttrium iron garnet films in the micrometer as well as in the sub-micrometer range and to develop customized functional layers by suitable substitution.

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