SmCo : SAMARIUM COBALT

SmCo magnets (Samarium Cobalt) have also a very strong magnetic field. They tend to resist demagnetization extremely well. Unlike Neodymium magnets, it is also very corrosion resistant. SmCo magnets can operate at higher temperatures up to 300°C and are widely used in applications in which higher operating temperature and higher corrosion and oxidation resistance are crucial. The temperature coefficient of remanence is usually less than ±0.05%.

Two common compositions of SmCo magnets are SmCo5 and Sm 2Co17. They can be sintered and bonded. Generally, the cost of SmCo magnets is higher than NdFeB magnets. But NdFeB magnets are stronger than SmCo magnets.

Widely used in instruments, watches, generators, transducers, jig, moulds, etc

Material Information

- An alloy compose of SmCo5/Sm2Co17 produce by powder metallurgical method.
- Extremely hard & brittle.
- High demagnetization resistance.
- Excellent anti-corrosion properties.
- More expensive than NdFeB magnets because of limited raw material supply.
- Outstanding thermal stability.

Typical Physical Properties

Curie Temperature (°C)	700-800
Maximum Operating Temperature (°C) for Sm2Co17	250 for SmCo5, 350
Resistivity (μ ohm.cm)	50-90
Hardness (Hv)	450-600
Density (g/cm3)	8.0-8.5
Relative Recoil Permeability (μrec)	1.10
Saturation Field Strength, kOe (kA/m)	37.5 (3000)
Temperature Coefficient of Br (%/°C)	-0.05 ~ -0.03
Temperature Coefficient of iHc (%/°C)	-0.25 ~ -0.19

Dimension Range / Nominal Tolerance of SmCo Magnets

RING MAGNET	OUTER DIA (mm)	INNER DIA (mm)	THICKNESS (mm)
Maximum	100	80	50
Minimum	2.6	1.8	0.5
Tolerance	±0.1	±0.1	±0.1
BLOCK MAGNET	LENGTH (mm)	WIDTH (mm)	THICKNESS (mm)
Maximum	100	80	50
Minimum	2.0	1.5	0.5
Tolerance	±0.1	±0.1	±0.1
DISC MAGNET	DIAMETER (mm)	THICKNESS (mm)	
Maximum	100	50	
Minimum	1.2	0.5	
Tolerance	±0.1	±0.1	

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Magnetic Properties of SmCo Magnets (Samarium Cobalt)

Material	Grade	Remanence		Coercivity		Intrinsic Coercivity		Max. Energy Product	
		Br(mT)	Br(kGs)	bHc(kA/m)	bHc(kOe)	iHc (kA/m)	iHc (kOe)	(BH)max (KJ/m^3	(BH)max (MGOe)
$SmCo_5$	S16	790 - 840	7.9 - 8.4	612 - 660	7.7 - 8.3	1830	23	118 - 135	15 - 17
	S18	840 - 890	8.4 - 8.9	644 - 692	8.1 - 8.7	1830	23	135 - 151	17 - 19
	S20	890 - 930	8.9 - 9.3	684 - 732	8.6 - 9.2	1830	23	150 - 167	19 - 21
	S22	920 -960	9.2 - 9.6	710 - 756	8.9 - 9.5	1830	23	167 - 183	21 - 23
	S24	960 - 1000	9.6 - 10.0	740 - 788	9.3 - 9.9	1830	23	183 - 199	23 - 25
Sm_2Co_{17}	S220	930 - 970	9.3 - 9.7	676 - 740	8.5 - 9.3	1433	18	160 - 183	20 - 23
	S240	950 - 1020	9.5 - 10.2	692 - 764	8.7 - 9.6	1433	18	175 - 191	22 - 24
	S260	1020 - 1050	10.2 - 10.5	748 - 796	9.4 - 10.0	1433	18	191 - 207	24 - 26
	S280	1030 - 1080	10.3 - 10.8	756 - 812	9.5 - 10.2	1433	18	207 - 220	26 - 28
	S300	1080 - 1100	10.8 - 11.0	788 - 835	9.9 - 10.5	1433	18	220 - 240	28 - 30
	S320	1100 - 1130	11.0 - 11.3	812 - 860	10.2 - 10.8	1433	18	230 - 255	29 - 32

HARD FERRITE (CERAMIC MAGNETS)

As important parts of magnetic materials, hard ferrite (ceramic) magnets play an important role in electrical, electronic information, car, motorcycle industries etc.
They are also widely used in medical treatment, mining and metallurgy, industrial automation, oil energy and civil industries.

Ceramic magnets are composed of iron oxide, barium and strontium elements. This class of magnets has a higher magnetic flux density, higher coercive force, and higher resistance to demagnetization and oxidation compared to other non-rare earth permanent magnets. The biggest advantage of such magnets is the low cost, which makes the hard ferrite magnets very popular in many permanent magnet applications. Due to their ceramic nature, ferrite magnets are very hard and brittle. Special machining techniques must to be utilized for these magnets. Ceramic or hard ferrite magnets come in discs, cylinders, rings, blocks and arcs and are charcoal grey.

Widely used in electrical appliances, educational instruments, magnetic assemblies, toys etc.

Material Information

- Produced by powder metallurgical method with chemical composition of Ba/SrO.6 Fe2 O3.
- Relatively brittle & hard.
- Good resistance to demagnetization.
- Excellent corrosion resistance.
- Raw material is readily available and low in cost.
- Good temperature stability.
- high coercive force and high electric resistance.
- Most widely used permanent magnets.

Typical Physical Properties

Curie Temperature (°C)	450
Maximum Operating Temperature (°C)	250
Hardness (Hv)	480-580
Density (g/cm3)	4.8 - 4.9
Relative Recoil Permeability (μrec)	1.05 - 1.20
Saturation Field Strength, kOe (kA/m)	10 (800)
Temperature Coefficient of Br (%/°C)	-0.2
Temperature Coefficient of iHc (%/°C)	0.3
Tensile Strength (N/mm)	<100
Transverse Rupture Strength (N/mm)	300

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