

# Magnetic Susceptibility Index for Gemstones

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Magnetic responses are standardized to 1/2" X 1/2" N-52 magnet cylinders.

Colorless and extremely pale stones of any species tend to be Inert (diamagnetic).

Black opaque stones of many species are strongly magnetic and may Pick Up or Drag.

Pick Up and Drag responses are weight-dependent. Direct responses on the Index apply to gems 1-4cts.

Larger gems may be too heavy to Pick Up or Drag. Smaller non-Garnet gems with strong magnetism may Pick Up.

Gemstone	Response Range	SI X 10 (-6) Range	Cause of Color
<b>Actinolite</b>			
Nephrite Jade (black)	Strong to Drags	321-577	Iron
Nephrite Jade (green)	Moderate to Drags	91-343	Iron, Chromium
Nephrite Jade (white, yellow)	Inert	< 0 (diamagnetic)	Iron
Pargasite (green)	Inert	< 0 (diamagnetic)	Iron, Vanadium
Pargasite (orangey brown)	Weak	35 SI	Iron
<b>Afghanite</b> (blue)	Inert	< 0 (diamagnetic)	Chromium, Vanadium
<b>Alexandrite</b> (see Chrysoberyl)			
<b>Almandine</b> (see Garnet)			
<b>Amazonite</b> (see Feldspar)			
<b>Amber</b> (any color)	Inert	< 0 (diamagnetic)	Charge Transfer involving Organic Compounds
<b>Amblygonite-Montebasite</b> (blue, green)	Inert	< 0 (diamagnetic)	Iron, Manganese
<b>Amethyst</b> (see Quartz)			
<b>Andalusite</b>			
Brownish Green	Inert to Weak	< 0 -26	Iron-Oxygen-Titanium Charge Transfer
Viridine or Mangan-Andalusite (dark green)	Moderate	100 SI	Manganese (Mn <sup>3+</sup> ), Iron
<b>Andradite</b> (see Garnet)			
<b>Anglesite</b> (transparent yellow)	Inert	< 0 (diamagnetic)	Sulfur?
<b>Apatite</b>			
Blue, Grass Green	Inert (Weak in rare cases)	< 0 (diamagnetic)	Rare Earths, Mang., Charge Transfer, Color Cent.
Chrome Green	Inert	< 0 (diamagnetic)	Chromium
Yellow, Yellowish Brown	Weak to Strong	< 20 - >120	Neodymium/Praesodymium
Purple	Inert to Weak	0- < 20	Manganese
<b>Aquamarine</b> (see Beryl)			
<b>Astrophyllite</b>	Strong	1146-1328	Iron, Manganese
<b>Axinite</b>			
Ferroaxinite (brown, bluish brown)	Drags	603-654 SI	Iron, Vanadium (blue)
Manganaxinite (yellow, brown)	Drags	345-404 SI	Manganese, possibly Charge Transfer
Manganaxinite (opaque black end member)	Drags	998 SI	Manganese
Magnesoaxinite (near-colorless end member)	Weak	17 SI	Magnesium (colorless)

<b>Azurite</b> (opaque)	Strong	382 SI	Copper
<b>Barite</b> (pale brown, blue)	Inert	< 0 (diamagnetic)	Color Centers
<b>Bastnasite</b> (light brown to dark reddish brown)	Drags (Picks Up under 1ct)	654-898 SI	Cerium, Neodymium, Praseodymium
<b>Benitoite</b>	Inert	< 0 (diamagnetic)	Iron-Titanium Charge Transfer
<b>Beryl</b>			
Emerald	Inert to Moderate	<0-87	Chromium, Vanadium
Synthetic Emerald	Weak to Strong	13-195	Chromium, Vanadium
Green Beryl	Inert to Weak	< 20	Iron
Aquamarine (pale to medium blue)	Weak to Moderate	20-100	Iron, Iron-Iron Charge Transfer
Synthetic Aquamarine	Moderate	109 SI	Iron
Blue Beryl (Maxixe)	Inert	< 0 (diamagnetic)	Color centers
Golden / Yellow Beryl	Inert to Weak	< 0-48	Iron, Oxygen-Iron Charge Transfer
Heliodor (yellowish green)	Inert	< 0 (diamagnetic)	Iron, Chromium
Morganite	Inert	< 0 (diamagnetic)	Manganese
Red Beryl (transparent Bixbite)	Strong	117 SI	Manganese
Synthetic Red Beryl	Moderate to Strong	126 SI	Cobalt
Pezzottaite (pink, Beryl Group)	Weak	< 20	Manganese
<b>Bismuth</b> (native metal)	Inert	< 0 (diamagnetic)	Bismuth
<b>Brazilianite</b> (transparent greenish yellow)	Inert	< 0 (Diamagnetic)	Iron, possibly in Color Centers
<b>Bumblebee "Jasper"</b> (mineral aggregate)	Moderate to Strong	Varies within the stone	Sulfur, Arsenic, Hematite
<b>Bustamite</b> (translucent)	Picks Up	2,995 SI	Manganese
<b>Calcite</b>			
Most Calcite Color Variations	Inert	< 0 (diamagnetic)	Iron, Manganese, Zinc
Pink Cobarito Calcite	Weak	22-26	Cobalt
<b>Carneilian</b> (see Quartz)			
<b>Cassiterite</b> (pale yellow)	Inert	< 0 (diamagnetic)	Iron
<b>Cavansite</b> (stabilized cab)	Moderate	> 82	Vanadium
<b>Celestite</b> (blue)	Inert	< 0 (diamagnetic)	Color Centers
<b>Charoite</b>	Weak	56-69	Manganese
<b>Chondrodite</b>	Inert	< 0 (diamagnetic)	Iron, Manganese
<b>Chromite</b> (see Spinel)			
<b>Chrysoberyl</b>			
Chrysoberyl	Weak to Moderate	20-127	Iron, Chromium
Alexandrite	Weak	43-52	Chromium
Synthetic Alexandrite	Inert	< 0 (diamagnetic)	Chromium, Vanadium
<b>Chrysocolla</b>	Moderate-Strong	104-239	Copper
<b>Chrysoprase</b> (see Quartz)			
<b>Citrine</b> (see Quartz)			
<b>Clinohumite</b>			
Red Clinohumite	Weak	65 SI	Iron, Manganese
Orange Clinohumite	Strong	334 SI	Manganese, Iron
<b>Clinozoisite</b>	Drags	373 SI	Iron, Chromium

<b>Cobaltite</b> (purity unknown)	Strong	No Data	Cobalt, Arsenic
<b>Copper</b>			
Pure Copper	Inert	< 0 (diamagnetic)	Copper
Native Copper (impurities)	Strong	No Data	Copper (and impurities)
<b>Coral</b>	Inert	< 0 (diamagnetic)	Organic Pigments
<b>Corundum</b>			
<b>Ruby</b>	Weak, sometimes Moderate	<20-48 (sometimes 78-113)	Chromium, Vanadium, Iron
Synthetic Ruby (red corundum)	Inert to Weak	< 0-17	Chromium, Titanium
<b>Sapphire</b>			
Blue Sapphire (iron-rich, igneous sources)	Weak to Moderate	22-82	Iron-Titanium & Iron-Iron Charge Transfer
Blue Sapphire (low-iron, metamorphic sources)	Inert to Weak	< 0 -65	Iron-Titanium & Iron-Iron Charge Transfer
Yellow, Orange, Padparadscha,Clr. Change Sapphire	Weak to Moderate	<20-117	Iron, Chromium, Various Charge Transfers
Green Sapphire	Weak to Strong	69-191	Iron, Chromium, Various Charge Transfers
Purple, Pink Sapphire	Inert to Weak	< 0-56	Chromium, Iron-Titanium Charge Transfer
Pale, Near-Colorless and Colorless Sapphire	Inert	< 0 (Diamagnetic)	Insufficient Chromophores
Brown Sapphire	Moderate	130 SI	Iron
Black Star Sapphire	Weak to Moderate	20-143	Iron, Titanium
Synthetic Sapphire (any color except red)	Inert	< 0 (diamagnetic)	Titanium
<b>Chrome Diopside</b> (see Diopside)			
<b>Cubic Zirconia (CZ)</b>			
Most CZ colors	Inert to Weak	< 0-39	Various Metals
Pink CZ	Drags	430-807	Erbium, Holmium
Color Change CZ (red to green)	Drags to Picks Up	1237 SI	Rare earth Metals
<b>Cuprite</b> (transparent to opaque)	Weak	74 SI	Band Gap process
<b>Danburite</b> (yellow)	Inert	< 0 (diamagnetic)	Neodymium, Praesodymium
<b>Demantoid</b> (see Garnet)			
<b>Diamond</b>			
Diamond (colorless, fancy colors, black )	Inert	< 0 (diamagnetic)	Color Centers (Nitrogen, Boron)
HTHP Synthetic Diamond (yellow,blue,colorless)	Inert to Picks Up (metal inclusions)	< 0 to Ferromagnetic	Color Centers (Nitrogen, Boron)
CVD Synthetic Diamond (colorless)	Inert	< 0 (diamagnetic)	N/A
<b>Diaspore</b>	Weak	39-48	Manganese, Iron, Chromium
<b>Diopside</b>			
Black Star Diopside	Picks Up	8,925- 9,960 Ferrimagnetic	Iron in NeedleInclusions of Magnetite
Chrome Diopside (pale green to dark green)	Weak to Strong	<20-296	Chromium, Vanadium, Iron
Vanadium Diopside (mint green)	Weak	< 20-39	Vanadium, Iron
Iron Diopside (grayish green)	Strong	122 SI	Iron, Chromium
Yellow Diopside	Weak	< 20	Manganese, Iron
Violane (blue opaque Diopside)	Inert	< 0 (diamagnetic)	Manganese
<b>Dioptase</b>	Strong to Drags	282-327	Copper
<b>Dolomite</b> (transparent yellow/brown)	Inert	< 0 (diamagnetic)	Iron
<b>Dumortierite</b>	Weak	< 20	Various
<b>Dunilite</b> (see Peridot)			

<b>Ekanite</b> (transparent green)	Weak	<20	Iron, (Radioactive due to Thorium)
<b>Emerald</b> (see Beryl)			
<b>Enstatite</b>			
Hypersthene (opaque black)	Drags to Picks Up	> 1298	Iron
Bronzite (opaque brown)	Drags to Picks Up	No Data	Iron
Enstatite (transparent brown, green)	Drags	308-681	Iron, Chromium
Chrome Enstatite	Strong	282 SI	Vanadium, Chromium, Iron
<b>Eosphorite</b>	Picks Up	2365 SI	Manganese, Iron
<b>Epidote</b>	Drags	491 SI	Iron
<b>Euclase</b> (pale blue, yellowish green)	Inert	< 0 (diamagnetic)	Iron to Iron Charge Transfer
<b>Eudialite</b> (transparent to opaque)	Strong to Drags	345-469	Manganese, Iron
<b>Feldspar Group</b>			
<b>Andesine Feldspar</b>			
Untreated (yellow, reddish brown) Andesine	Weak	< 20	Iron, Copper
Diffused (red & green) Andesine	Weak	< 20	Copper, Iron
<b>Bytownite Feldspar</b>	Weak	35 SI	Iron
<b>Labradorite Feldspar</b>			
Oregon Sunstone (with copper schiller)	Weak	< 29	Microscopic Copper Inclusions
Oregon Sunstone (red, green)	Weak	< 29	Microscopic Copper Inclusions
Spectral Labradorite	Inert	< 0 (diamagnetic)	Light Diffraction
Spectral Labradorite with magnetite inclusions	Weak to Picks Up	< 20-1779	Light Diffraction
Yellow Labradorite	Weak	< 26	Iron
<b>Microcline Feldspar</b>			
Amazonite	Inert	< 0 (diamagnetic)	Color Centers involving Lead
<b>Oligoclase Feldspar</b>			
African Sunstone (with Hematite, African & Indian)	Inert	< 0 (diamagnetic)	Iron (Hematite Inclusions)
Pale Green Oligoclase	Inert	< 0 (diamagnetic)	No Data
<b>Orthoclase Feldspar</b>			
Moonstone Orthoclase	Inert	< 0 (diamagnetic)	Light Scattering
Yellow (Noble) Orthoclase	Weak to Moderate	65-104	Iron
<b>Sanidine Feldspar</b>	Moderate	No Data	Iron
<b>Fluorite</b> (any color)	Inert	< 0 (diamagnetic)	Color Centers (mostly)
<b>Forsterite</b>			
Peridot (green Forsterite)	Drags	417-590	Iron
Near-colorless Forsterite	Weak	52 SI	Iron
Dunilite (brown Forsterite)	Picks up	1435 SI	Iron
Synthetic Forsterite (blue)	Weak	< 20	Chromium
<b>Gadolinite</b> (opaque)	Picks Up	8,780 SI	Iron, Beryllium, Rare earth Metals
<b>Garnet Group</b>			
<b>Almandine Garnet</b>	Picks Up	1871-3094	Iron
<b>Andradite Garnet</b>			

Demantoid Garnet	Picks Up	2180-2752	Iron, Chromium/Vanadium
Brown Andradite & Topazolite	Picks Up	2559-2907	Charge Transfer involving Iron
Melanite (black) Garnet	Picks Up	1866 SI	Charge Transfer involving Iron
Irridescent Andradite	Picks Up	2930 SI	Light Diffraction (Interference Colors)
<b>Grossular Garnet</b>			
Hessonite (pale to dark yellow/orange)	Moderate to Strong (Drag is possible)	91-321	Charge Transfer involving Iron
Hydrogrossular (green, pink, red)	Weak to Strong	74-339	Iron, Chromium/Vanadium, Manganese
Mali Garnet	Drags	291-1099	Iron
Green Grossular (including Tsavorite & Merelani)	Weak to Strong	20-309	Chromium/Vanadium, Iron
Roselite (pink)	Strong	113-147	Manganese
Near-Colorless and Leuco Grossular	Weak to Moderate	15-127	Chromium/Vanadium, Manganese, Iron
<b>Pyrope Garnet</b>			
Standard Pyrope Garnet	Picks Up	1163-1971	Iron, Chromium/Vanadium
Rhodolite Garnet	Picks Up	1007-1890	Iron, Chromium/Vanadium
Malaya Garnet	Picks Up	1127-2689	Manganese, Chromium/Vanadium, Iron
Chrome Pyrope	Drags to Picks Up	454-999	Chromium, Iron
Pastel Pyrope	Drags to Picks Up	618-1236	Manganese, Chromium/Vanadium, Iron
Color-Change Pyrope	Picks Up	1445-2326	Manganese, Iron, Chromium/Vanadium
<b>Spessartine Garnet</b>			
Spessartine Garnet	Picks Up	4301-4728	Manganese, some Iron
Color-Change Spessartine	Picks Up	2435-4179	Manganese, Iron, Chromium/Vanadium
Malaya Garnet	Picks Up	2734-3325	Manganese, Iron, Chromium/Vanadium
<b>Uvarovite Garnet</b>	Drags	909-998	Chromium/Vanadium
<b>Synthetic Garnet</b>			
GGG (Gadolinium Gallium Garnet) Any Color	Picks Up	6219-7404	Gadolinium (colorless) and Various dopants
SGG (Samarium Gallium Garnet) Yellow	Strong	291 SI	Samarium
YAG (Yttrium Aluminum Garnet) Yellow	Inert to Weak	< 0-35	Various Dopants
YAG (Yttrium Aluminum Garnet) Green	Inert to Strong	< 0-339	Chromium, Rare Earths
YAG (Yttrium Aluminum Garnet) Pink	Strong to Drags (rarely Picks Up)	356-391 (rare 5433)	Manganese (rarely Erbium)
YAG (Yttrium Aluminum Garnet) Violet	Weak to Moderate	30-126	Neodymium
<b>Gaspeite</b>	Strong	859 SI	Nickel, Iron
<b>Glass (man-made)</b>			
Most Glass Colors	Inert	< 0 (diamagnetic)	Various
Blue Glass	Inert to Weak	< 0-61	Cobalt
Pink Glass	Moderate to Drags	95-700	Erbium, Holmium
Goldstone Glass (various colors)	Moderate to Strong	135-221	Particles: Copper, Cobalt, Manganese, or Chromium
Glass/Garnet Doublet	Inert Glass side/ Strong Garnet side	794-942	Iron
<b>Gold (pure 24k)</b>	Inert	< 0 (diamagnetic)	Gold
<b>Hauyne</b>	Weak	No Data	Color Centers
<b>Hematite (natural black and Specular)</b>	Drags to Picks Up	2604-6853	Iron
<b>Hemetine (imitation Hematite)</b>	Picks Up	> 86,000 Ferromagnetic	Iron
<b>Hemimorphite (blue)</b>	Inert	< 0 (diamagnetic)	Copper

<b>Hessonite</b> (see Garnet)			
<b>Herderite</b> (transparent light orange)	Inert	<0 (diamagnetic)	No Data, possibly charge transfer or color centers
<b>Howlite</b> (white or dyed)	Inert	< 0 (diamagnetic)	None or Man-made Dyes
<b>Idocrase/Vesuvianite</b> (green)	Strong	217-233	Iron
<b>Indicolite</b> (see Tourmaline)			
<b>Iolite</b>	Moderate-Strong	105-200	Iron, Iron-Iron Charge Transfer
<b>Iron</b> (native element)	Picks Up	Ferromagnetic	Iron
<b>Ivory</b>	Inert	< 0 (diamagnetic)	Organic
<b>Jadeite Jade</b>			
Green Jadeite	Weak to Moderate	65-104	Chromium
Orange Jadeite	Weak	< 20	Iron
Red Jadeite	Weak to Moderate	40-122	Iron
Purple Jadeite	Weak to Moderate	22-130	Iron -Iron Charge Transfer, Iron
White/Yellow Jadeite	Inert to Weak	< 0-48	Iron
Black Jadeite	Picks Up	2070 SI	Iron
<b>Jeremejevite</b>	Inert	<0 (diamagnetic)	Charge Transfer involving Iron
<b>Jet</b>	Inert	< 0 (diamagnetic)	Organic Carbon
<b>Johachidolite</b>	Inert	<0 (diamagnetic)	Not Known
<b>Kornerupine</b>			
Blue Kornerupine	Weak	< 20	Vanadium
Brownish Green Kornerupine	Moderate to Strong	100-282	Iron, Vanadium
Green Kornerupine	Moderate	91 SI	Iron, Chromium, Vanadium
<b>Kunzite</b> (see Spodumene)			
<b>Kyanite</b>			
Blue Kyanite	Inert, rarely Weak	< 0 - < 20	Iron- Titanium Charge Transfer
Blue-green Chrome Kyanite	Inert to Weak	<0 -30	Chromium, Iron- Titanium Charge Transfer
Green Kyanite	Weak to Moderate	61-117	Iron, Chromium, Vanadium
Orange Kyanite	Weak to Moderate	52- 95	Iron and/or Manganese
<b>Labradorite</b> (see Feldspar)			
<b>Lapis Lazuli</b>	Inert	< 0 (diamagnetic)	Charge Transfer involving Sulfur
<b>Lazulite</b> (transparent blue)	Weak to Strong	No Data	Iron-Iron Charge Transfer
<b>Libyan Desert Glass</b> (natural glass)	Inert	< 0 (diamagnetic)	Iron
<b>Magnesite</b> (transparent gray)	Drags	985 SI	Iron
<b>Magnetite</b> (see Spinel)			
<b>Malachite</b>	Drags	477 SI	Copper
<b>Maw Sit Sit</b>	Moderate to Strong	139-230	Chromium, Iron
<b>Moissanite</b> (man-made, colorless, pale colors)	Inert	< 0 (diamagnetic)	Color Centers involving Nitrogen, Boron, Aluminum
<b>Moldavite</b> (natural glass)	Weak	69 SI	Iron
<b>Moonstone</b> (see Feldspar)			
<b>Morganite</b> (see Beryl)			
<b>Muscovite/Mica</b>			
Lepidolite (lavender)	Inert	< 0 (diamagnetic)	Lithium

Fuchsite	Weak	< 20-69	Chromium, Iron
<b>Nephrite Jade</b> (see Actinolite)			
<b>Nicolite</b>	Moderate	No Data	Nickel, Arsenic
<b>Nummrite (Anthophyllite &amp; Gedrite)</b>	Drags	1094 SI	Light Diffraction in black matrix, Iron
<b>Orpiment</b> (yellow)	Inert	< 0 (diamagnetic)	Sulfur (also contains Arsenic)
<b>Obsidian</b> (natural glass)			
Mahogany Obsidan	Picks Up	1953 SI	Iron
Opaque Obsidan	Drags	304 -750	Iron
Translucent Obsidan	Strong	247 SI	Iron
Transparent Obsidan (black)	Weak to Moderate	74 -95	Iron
Transparent Obsidan (near-colorless)	Weak	22 SI	Iron
<b>Onyx</b> (see Quartz)			
<b>Opal</b>			
Prescious Opal (with play of color)	Inert	< 0 (diamagnetic)	Light Diffraction
Synthetic Opal with play of color)	Inert	< 0 (diamagnetic)	Light Diffraction
Common Opal (blue, pink, white)	Inert	< 0 (diamagnetic)	Copper, Diamagnetic Impurities
Blue Jelly Opal (no play of color)	Inert	< 0 (diamagnetic)	Light Scattering
Blue Opal (Chrysocolla in Opal)	Inert	<0 (diamagnetic)	Copper in Microscopic Gem Silica inclusions
Fire Opal from Mexico (Yellow, Orange, Red)	Inert	<0 (diamagnetic)	Iron in Microscopic Iron Oxide Inclusions
Fire Opal from Brazil, Oregon, Mali (Yellow, Orange)	Weak	<20- 48	Iron in Microscopic Iron Oxide Inclusions
Prase Opal (green)	Weak	< 20	Nickel in Microscopic Chrysoprase Inclusions
Greenish Yellow "Kiwi" Opal (Madagascar)	Weak	< 0- 26	probably Iron, possibly Manganese
Boulder & Matrix Opal	Strong to Drags	No Data	Light Diffraction, Iron in the Host Matrix
<b>Pargasite</b> (see Actinolite)			
<b>Parisite</b>	Drags	345 SI	Cerium, Neodymium, Praseodymium
<b>Pearl</b>	Inert	< 0 (diamagnetic)	Interference Colors, Charge Transfer
<b>Pectolite</b> (blue Larimar)	Inert	< 0 (diamagnetic)	Copper
<b>Peridot</b> (see Forsterite)			
<b>Pezzottaite</b> (Beryl Group)	Weak	< 20	Manganese
<b>Plastic</b>	Inert	< 0 (diamagnetic)	Various
<b>Platinum</b>	Strong	No data	Platinum
<b>Prehnite</b> (green)	Weak to Moderate	26-122	Iron
<b>Psilomelane</b>	Strong to Drags	343-1007	Manganese
<b>Purpurite</b> (translucent to opaque)	Drags to Picks Up	? - 1502	Manganese, Iron
<b>Pyrite</b>	Weak	43 SI	Iron-Sulphur properties
<b>Pyromorphite</b> (opaque)	Inert	< 0 (diamagnetic)	Copper, Iron
<b>Pyrope</b> (see Garnet)			
<b>Pyroxymangite</b> (transluc. dimorph of Rhodonite)	Picks Up	No Data	Manganese
<b>Pyrrhotite</b>	Picks Up	Ferromagnetic	Iron
<b>Quartz</b> (macrocrystalline)			
Amethyst	Inert	< 0 (diamagnetic)	Charge Transfer & Color Centers involving Iron
Citrine	Inert	< 0 (diamagnetic)	Color Centers, Oxygen-Iron Charge Transfer

Madeira Citrine and rare yellow "Iron" Citrine	Weak	< 20- 26	Iron
Rock Crystal (colorless Quartz)	Inert	< 0 (diamagnetic)	None
Smoky Quartz	Inert	< 0 (diamagnetic)	Color Centers involving Aluminum
Synthetic Quartz (any color)	Inert	< 0 (diamagnetic)	Various
<b>Quartz with Inclusions</b>			
Rutile, Hematite & Most Other Inclusions	Inert	< 0 (diamagnetic)	Varies with type of Inclusions
Tourmalinated Quartz (black or blue Tourmaline)	Weak	43-56	Iron in Tourmaline Macro Inclusions
Green Quartz (Hedenbergite Inclusions)	Weak	56 SI	Iron in Microscopic Hedenbergite Inclusions
Paraiba Quartz (Blue Paraiba Tourmaline Inclusion)	Weak	56 SI	Copper, Manganese In Microscopic Inclusions of Paraiba Tourmaline
Rose Quartz	Inert	< 0 (diamagnetic)	Microscopic Inclusions, Color Centers, Charge Transfer
Sunset Quartz	Inert	< 0 SI	Iron in Needle Inclusions- possibly Limonite
Tiger's Eye	Inert to Picks Up	< 0-3889 (varies with iron)	Iron oxide (Fe <sup>3+</sup> ), Limonite macro Inclusions
Hawk's Eye	Weak	< 20	Iron oxide (Fe <sup>2+</sup> ), Limonite macro Inclusions
<b>Chalcedony Quartz</b> (microcrystalline)			
Most Agates & Jaspers	Inert	< 0 (diamagnetic)	Iron in Microscopic Iron Oxide Inclusions
Red Jasper	Weak to Picks Up	69-8836	Iron in Microscopic Iron Oxide Inclusions
Mahogany Jasper	Strong	217 SI	Iron in Microscopic Iron Oxide Inclusions
Bloodstone	Weak to Strong	26-521	Iron in Microscopic Iron Oxide Inclusions
Carnelian	Inert	< 0 (diamagnetic)	Iron in Microscopic Iron Oxide Inclusions
Chrysoprase (pale green to medium green)	Inert to Strong	<0-224	Nickel in Microscopic Willemseite Inclusions
Gem Silica (Chrysocolla in Chalcedony)	Inert to Moderate	<0-82	Copper in Microscopic Chrysocolla Inclusions
Blue Chalcedony	Inert	< 0 (diamagnetic)	Light Scattering
Purple Chalcedony	Inert	< 0 (diamagnetic)	Light Scattering, Microscopic Sugilite Inclusions
Fire Agate	Picks Up	3975 SI	Iron, Light Diffraction
Chrome Chalcedony (Mtorolite)	Inert to Weak	< 20 SI	Chromium in Microscopic Chrom. Oxide Inclusions
Myrickite (Agatized Cinnabar)	Strong	Varies within the stone	Mercury, Inclusions with Iron and/or Manganese
Onyx	Inert	< 0 (diamagnetic)	Iron in Microscopic Iron Oxide Inclusions
Pietersite	Inert to Strong	< 0-305 (varies with iron)	Iron Oxide, Crocidolite macro Inclusions
<b>Quartzite</b>			
Aventurine Quartz (green)	Inert to Weak	< 0-27	Chromium in Fuchsite Mica inclusions
Rhodochrosite (opaque to transparent)	Picks Up	3515-5269 SI	Manganese
Rhodolite (see Garnet)			
Rhodonite (opaque to transparent)	Picks Up	3610-4288	Manganese, Iron
Richterite (blue opaque)	Moderate	113 SI	Iron, Titanium
Rubellite (see Tourmaline)			
Ruby (see Corundum)			
<b>Rutile</b>			
Opaque Metallic Gray	Strong	122 SI	Iron, Titanium
Transparent Red	Strong	327 SI	Iron, Titanium
Synthetic Rutile (transparent colorless)	Inert to Very Weak	< 0 (diamagnetic)	None
<b>Sapphire</b> (see Corundum)			
<b>Sapphirine</b>	Weak to Moderate	73-95 SI	Iron, Charge Transfer involving Iron



<b>Scapolite</b> (yellow, purple)	Inert	< 0 (diamagnetic)	Color Centers, Charge Transfer
<b>Selenite</b> (colorless)	Inert	< 0 (diamagnetic)	N/A
<b>Scheelite</b> (transparent yellow)	Inert	< 0 (diamagnetic)	Neodymium
<b>Seraphinite (Clinochlore)</b>	Moderate	126 SI	Iron
<b>Serpentine</b>			
Opaque Green Bowneite	Drags to Picks Up	363-1519	Iron, Chromium, Nickel
Translucent Green Bowenite	Weak	43 SI	Iron, Chromium, Nickel
Translucent Green Williamite (w/Chromite)	Weak (strong with chromite inclus.)	< 20	Nickel, Iron, Chromium
<b>Shattuckite</b>	Strong	256-286	Copper
<b>Shell</b>	Inert	< 0 (diamagnetic)	Organic
<b>Siderite</b> (transparent)	Picks Up	4,924 SI	Iron
<b>Sillimanite</b>			
Green/ Yellow Sillimanite	Weak	35-52 SI	Iron, Chromium
Fibrolite (bluish gray Sillimanite)	Weak	< 20	possibly Charge Transfer
<b>Silver</b> (native element)	Inert	< 0 (diamagnetic)	Silver
<b>Sinhalite</b>			
Yellow/Brown	Weak to Strong	78 SI	Iron, Charge Transfer involving Iron
Brown	Strong	140-152 SI	Iron
<b>Smithsonite</b>			
Pink Smithsonite	Inert to Weak	< 0 -74	Manganese, Cobalt
Blue Smithsonite	Weak	26 SI	Copper
Green Smithsonite	Moderate to Strong	No Data	Copper
Yellow Smithsonite	Weak	43 SI	Cadmium, Iron
<b>Sodalite</b>			
Sodalite (translucent to opaque)	Inert to Weak	< 0-48	Color Centers
Hackmanite (transparent)	Inert	< 0 (diamagnetic)	Color Centers
<b>Spessartine</b> (see Garnet)			
<b>Sphalerite</b> (orange, yellow, green)	Inert	< 0 (diamagnetic)	Iron-Sulfur Charge Transfer, Cobalt (green)
<b>Sphene (Titanite)</b>			
Yellow/Brown Sphene	Weak to Strong	30-78	Neodymium, Iron
Green Sphene	Weak	35-52	Chromium, Neodymium, Iron
<b>Spinel</b>			
Blue (light blue to dark blue)	Weak to Strong (Drag is rare)	35-200 (360 rare)	
Cobalt ("electric" blue)	Weak to Moderate	55-91	Cobalt, Iron
Red	Weak to Strong	17-139	Chromium, Iron
Pink (pale to vivid pink)	Inert to Strong	<0-165	Chromium, Iron
Purple	Weak	22-56	Chromium, Cobalt, Iron
Gray (bluish, pinkish)	Weak	35-61	Primarily Iron
Orange, Pinkish Orange	Inert-Weak	< 0-<20	Chromium, Iron
Green (bluish, grayish)	Weak	42-48	Iron, Iron-Iron Charge Transfer
Near-colorless (pinkish, grayish)	Inert to Weak	<0-17	None
<b>Gahnite</b> (transparent dark green Zinc Spinel)	Strong	218 SI	Iron-Iron Charge Transfer

<b>Hercynite</b> (opaque black Iron Spinel)	Drags to Picks Up	1263-1328	Iron
<b>Magnetite</b> (opaque black Spinel)	Picks Up	Ferrimagnetic	Iron
<b>Chromite</b> (opaque black iron-chromium Spinel)	Drags	No Data	Iron, Chromium
<b>Synthetic Spinel</b>			
Synthetic Blue Spinel (flame-fusion)	Inert (can be weak in rare cases)	< 0 (diamagnetic)	Cobalt, (Manganese in rare cases)
Synthetic Blue Spinel (flux-grown)	Weak	< 20	Cobalt
Synthetic Pink to Red Spinel (flux-grown)	Inert to Weak	<0- < 20	Chromium
Synthetic Yellowish Green Spinel (flame fusion)	Weak to Moderate	39-122	Manganese
Synthetic Green Spinel (flame fusion)	Inert	< 0 (diamagnetic)	Cobalt, Manganese
<b>Spodumene</b>			
Kunzite (pink, purple)	Inert	< 0 (diamagnetic)	Manganese, Color Centers
Pale Yellow/Green Spodumene	Inert to Weak	< 0 -56	Manganese, Iron-Iron Charge Transfer, Color Cntrs
Hiddenite (pale green, permanent color)	Weak	<20 -65	Chromium, Manganese
<b>Staurolite</b>			
Transparent Staurolite	Picks Up	927-1054	Iron
Opaque Staurolite	Drags	890 SI	Iron
<b>Strontium Titanate</b> (colorless or yellow)	Inert	< 0 (diamagnetic)	None or Manganese (yellow)
<b>Sunstone</b> (see Feldspar)			
<b>Sugilite</b>			
Opaque Massive Sugilite	Drags to Picks Up	556-950	Manganese, Iron
Translucent Sugilite	Strong	170 SI	Manganese, Iron
<b>Taaffeite</b> (transparent purple)	Strong	135 SI	Iron, Chromium
<b>Tantalite</b>			
Ferrotantalite (gray)	Picks Up	No Data	Iron, Manganese
Manganotantalite (red)	Picks Up	2808 SI	Manganese, Iron
<b>Titanium</b> (native element)	Weak	No Data	Titanium
<b>Topaz</b>			
Blue, Pink, Sherry, Brown, Green, Yellow	Inert	< 0 (diamagnetic)	Color Centers, Chromium
Imperial Topaz (reddish orange)	Inert	< 0 (diamagnetic)	Color Centers, Chromium
<b>Tortoise Shell</b>	Inert	< 0 (diamagnetic)	Organic
<b>Tourmaline Group</b>			
<b>Dravite</b>			
Brown, Pink-Brown, Orange-Brown, Yellow-Brown	Inert	< 0 (diamagnetic)	Iron-Titanium Charge Transfer
Green Chrome Tourmaline / Vanadium Tourmaline	Inert (occasionally very weak)	< 0 - <20	Vanadium, Chromium
<b>Elbaite/Liddicoatite</b>			
Colorless "Achroite"	Inert	< 0 (diamagnetic)	N/A
Verdelite: Green, Grayish Green (Medium to Dark)	Strong to Drags	148-418	Iron, Iron-Titanium Charge Transfer
Green: Pale	Weak to Moderate	43- 260 SI	Iron, Iron-Titanium Charge Transfer
Yellow, Greenish Yellow, Brownish Yellow	Weak to Drags	<20-512	Manganese-Titanium Charge Transfer, Mn., Iron
Paraiba: Blue	Inert-Strong	<0-286	Copper, Manganese
Paraiba: Green	Weak-Drag	17-386	Copper, Manganese
Indicolite: Blue/Greenish Blue (Medium to Dark)	Drags	304-447	Iron, Iron-Iron Charge Transfer

Blue: Pale	Strong	55-254	Iron
Purple: Pale Lilac	Moderate-Strong	87 -213 SI	Manganese
Rubellite (Red)	Inert to Moderte	< 0-78	Manganese, Color Centers
Pink, Purplish Pink	Inert to Moderate	< 0-156	Manganese, Iron
Reddish Brown, Pinkish Brown, Pinkish Orange	Weak to Drags	< 20- 547 SI	Manganese, Iron
Gray (transparent), Purplish Gray Bluish Gray	Drags	469-529	Iron, Mang., Titanium, Iron-Iron Charge Transfer
<b>Rossmanite</b>			
Pinkish purple (translucent)	Weak	< 20	Manganese
<b>Schorl</b>			
Black (opaque)	Drags	773-990 SI	Iron, Mang., Titanium, Iron-Iron Charge Transfer
<b>Uvite</b>			
Brownish Red	Strong	218-243 SI	Iron
Yellowish Green	Inert	< 0 (diamagnetic)	Chromium, Vanadium
<b>Tanzanite</b> (see Zoisite)			
<b>Triphylite</b> (transparent)	Picks Up	3289 SI	Iron, Manganese
<b>Triplite</b> (transparent orange)	Picks Up	4,706-4,982 SI	Manganese
<b>Tsavorite</b> (see Garnet)			
<b>Tugtupite</b>	Inert	< 0 (diamagnetic)	Color Centers
<b>Turquoise</b>			
Blue	Weak to Moderate	26-135	Copper
Green	Weak to Strong	35-278	Copper, Iron
<b>Variscite</b>			
Variscite (green)	Inert to Moderate	< 0-117	Chromium, Iron
Metavariscite (chrome green)	Inert	< 0 (diamagnetic)	Chromium
<b>Vesuvianite</b> (see Idocrase)			
<b>Viridine</b> (see Andalusite)			
<b>Vivianite</b>	Picks Up	1766 SI	Iron
<b>Wulfenite</b> (orange, colorless)	Inert	< 0 (diamagnetic)	Charge Transfer involving Chromium & Oxygen
<b>Xenotime</b>	Picks Up	No Data	Erbum, Holmium
<b>YAG</b> (see Garnet)			
<b>Zincite</b> (red, yellow)	Inert	< 0 (diamagnetic)	Manganese, Iron
<b>Zircon</b>			
Zircon (yellow, brown, orange, pink, red)	Inert	< 0 (diamagnetic)	Color Centers, Uranium
Zircon (blue)	Inert	< 0 (diamagnetic)	Uranium
Zircon (green, metamict)	Inert (rarely weak)	< 0 -< 20	Uranium
<b>Zoisite</b>			
Tanzanite (blue, purple)	Inert	< 0 (diamagnetic)	Vanadium (V4+)
Zoisite (brown, yellow)	Inert	< 0 (diamagnetic)	Vanadium (V3+)
Zoisite (green)	Inert	< 0 (diamagnetic)	Chromium/Vanadium
Zoisite (pink, transparent Thulite)	No Data	No Data	Manganese
Thulite (opaque pink Zoisite)	Picks Up	3454 SI	Manganese





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