

# Magnetic Susceptibility Index for Gemstones

©2010 Kirk Feral

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>Amber</b> (any color)	Inert	< 0 (diamagnetic)	Charge Transfer involving Organic Compounds
<b>Amblygonite-Montebrasite</b> (blue, green)	Inert	< 0 (diamagnetic)	Iron, Manganese
<b>Andalusite</b>	Inert to Weak	< 0 -26	Iron-Oxygen-Titanium Charge Transfer
<b>Apatite</b>			
Transparent blue, green, yellow	Inert (Weak in rare cases)	< 0 (diamagnetic)	Mang., Rare-earth, Charge Transfer, Color Centers
Yellow, yellowish brown	Weak to Strong	< 20 - >120	Rare-earth Metals
<b>Astrophyllite</b>	Strong	1146-1328	Iron, Manganese
<b>Axinite</b> (pale to dark)	Drags	309-616 SI	Iron
<b>Azurite</b> (opaque)	Strong	382 SI	Copper
<b>Barite</b> (pale brown, blue)	Inert	< 0 (diamagnetic)	Color Centers
<b>Bastnasite</b> (pale to dark)	Drags (Picks Up under 1ct)	654-898 SI	Cerium (a Rare-earth metal)
<b>Benitoite</b>	Inert	< 0 (diamagnetic)	Iron-Titanium Charge Transfer
<b>Beryl</b>			
Aquamarine (pale to medium blue)	Weak to Moderate	20-100	Iron, Iron-Iron Charge Transfer
Golden / Yellow Beryl	Inert to Weak	< 0-48	Iron
Heliodor (yellowish green)	Inert	< 0 (diamagnetic)	Chromium, Iron
Morganite	Inert	< 0 (diamagnetic)	Manganese
Blue Beryl (Maxixe)	Inert	< 0 (diamagnetic)	Color centers
Red Beryl (transparent Bixbite)	Strong	117 SI	Manganese
Green Beryl	Inert to Weak	< 20	Iron
Emerald	Inert to Moderate	<0-87	Chromium, Vanadium
<b>Synthetic Emerald</b>	Weak to Moderate	26-143	Chromium, Vanadium
<b>Synthetic Red Beryl</b>	Moderate to Strong	126 SI	Cobalt
<b>Synthetic Aquamarine</b>	Moderate	109 SI	Iron

<b>Bismuth</b> (native metal)	Diamagnetic	< 0 (diamagnetic)	Bismuth
<b>Bumblebee "Jasper"</b> (mineral aggregate)	Moderate to Strong	Varies within the stone	Sulfur, Arsenic, Hematite
<b>Calcite</b>			
<b>Calcite</b>			
Most Calcite Color Variations	Inert	< 0 (diamagnetic)	Iron, Manganese, Zinc
Pink Cobalto Calcite	Weak	22-26	Cobalt
<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>	Drags	Not Tested	Iron, Chromium
<b>Chrysoberyl</b>			
Chrysoberyl	Weak to Moderate	20-127	Iron
Alexandrite	Weak	43 SI	Chromium
<b>Synthetic Alexandrite Chrysoberyl</b>	Inert	< 0 (diamagnetic)	Chromium
<b>Chrysocolla</b>	Moderate-Strong	104-239	Copper
<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>			
Black Star Sapphire	Weak to Moderate	20-143	Iron, Titanium
Brown (Emery)	Moderate	130 SI	Iron
Blue Sapphire from Iron-rich Locations	Weak to Moderate	22-82	Iron-Titanium Charge Transfer
Blue Sapphire from Iron-poor Locations	Inert to Weak	< 0 -<20	Iron-Titanium Charge Transfer
Green, Yellow, Orange, Padparadscha,Clr Change	Weak to Moderate (rarely Strong)	<20-191	Iron, Chromium, Various Charge Transfers
Purple, Pink	Inert to Weak	< 0-56	Chromium, Iron-Titanium Charge Transfer
Pale, Near-Colorless and Colorless	Inert	< 0 (Diamagnetic)	Insufficient Chromophores
Ruby	Weak, sometimes Moderate	<20-48 (sometimes 78-113)	Chromium, Vanadium, Iron
<b>Synthetic Ruby</b> (red corundum)	Inert to Weak	< 0-17	Chromium, Titanium
<b>Synthetic Sapphire</b> (any color except red)	Inert	< 0 (diamagnetic)	Titanium
<b>Cubic Zirconium</b>			
Most CZ colors	Inert to Weak	< 0-39	Various
Pink CZ	Drags	430-807	Rare-earth Metals
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)	Rare Earth Elements

<b>Diamond</b> (colorless, fancy colors, black )	Inert	< 0 (diamagnetic)	Color Centers (Nitrogen, Boron)
<b>HTHP Synthetic Diamond</b> (yellow,blue,colorless)	Inert to Picks Up (metal inclusions)	< 0 to Ferromagnetic	Color Centers (Nitrogen, Boron)
<b>CVD Synthetic Diamond</b> (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 Needle Inclusions of Magnetite
Chrome Diopside (chrome green)	Weak to Strong	56-296	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	Iron
Violane (blue opaque Diopside)	Inert	< 0 (diamagnetic)	Manganese
<b>Dumortierite</b>	Weak	< 20	Various
<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
<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
<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>			
Sunstone (with Hematite, African & Indian)	Inert	< 0 (diamagnetic)	Iron (Hematite Inclusions))
<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>Gadolinite</b> (opaque)	Picks Up	8,780 SI	Iron, Beryllium, Rare-earth Metals
<b>Garnet Group</b>			
<b>Almandine Garnet</b>	Picks Up	1926-3094	Iron

<b>Andradite Garnet</b>			
Demantoid Garnet	Picks Up	2253-2752	Iron, Chromium
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	91-345	Charge Transfer involving Iron
Hydrogrossular (green, pink)	Weak to Strong	74-339	Iron, Chromium, Manganese
Mali Garnet	Drags	234-1099	Iron
Green Grossular (including Tsavorite & Merelani)	Weak to Strong	20-309	Vanadium, Chromium, Iron
Rosolite (pink)	Strong	147 SI	Manganese
<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	2734-3089	Manganese, Iron, Chromium, Vanadium
<b>Uvarovite Garnet</b>	Picks Up	998 SI	Chromium, Vanadium
<b>Synthetic Garnet</b>			
GGG (Gadolinium Gallium Garnet) Any Color	Picks Up	6219-7404	Gadolinium (colorless) and Various dopants
SGG (Samarium Gadolinium Garnet) Yellow	Strong	291 SI	Samarium (a Rare-earth metal)
YAG (Yttrium Aluminum Garnet) Yellow	Inert to Weak	< 0-35	Various Dopants
YAG (Yttrium Aluminum Garnet) Green	Inert to Strong	< 0-352	Chromium
YAG (Yttrium Aluminum Garnet) Pink	Strong to Drags (rarely Picks Up)	356-391 (rare 5433)	Manganese
YAG (Yttrium Aluminum Garnet) Violet	Weak	30 SI	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
Goldstone Glass (various colors)	Moderate to Strong	135-221	Copper particles, Cobalt, Manganese, 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>Hematine (imitation Hematite)</b>	Picks Up	> 86,000 Ferromagnetic	Iron
<b>Hemimorphite (blue)</b>	Inert	< 0 (diamagnetic)	Copper
<b>Howlite (white or dyed)</b>	Inert	< 0 (diamagnetic)	None or Man-made Dyes
<b>Idocrase (green)</b>	Strong	217-233	Iron

<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, Iron
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> (green)	Moderate to Strong	100-282	Iron, Chromium
<b>Kyanite</b>			
Blue Kyanite	Inert, rarely Weak	< 0 - < 20	Iron- Titanium Charge Transfer
Green Kyanite	Weak	61 SI	Iron, Vanadium
Orange Kyanite	Moderate	95 SI	Iron and/or Manganese
<b>Lapis Lazuli</b>	Inert	< 0 (diamagnetic)	Charge Transfer involving Sulfur
<b>Lazulite</b> (transparent)	Strong	No Data	Iron-Iron Charge Transfer
<b>Libyan Desert Glass</b> (natural glass)	Inert	< 0 (diamagnetic)	Iron
<b>Magnetite</b>	Picks Up	Ferrimagnetic	Iron
<b>Malachite</b>	Drags	477 SI	Copper
<b>Maw Sit Sit</b>	Moderate to Strong	139-230	Chromium, Iron
<b>Moldavite</b> (natural glass)	Weak	69 SI	Iron
<b>Muscovite/Mica</b>			
Lepidolite (lavender)	Inert	< 0 (diamagnetic)	Lithium
Fuchsite	Weak	< 20-69	Chromium, Iron
<b>Nicolite</b>	Moderate	No Data	Nickel, Arsenic
<b>Nuummite (Anthophyllite &amp; Gedrite)</b>	Drags	1094 SI	Light Diffraction in black matrix, Iron
<b>Obsidian</b>			
Mahogany Obsidian	Picks Up	1953 SI	Iron
Opaque Obsidian	Drags	304 -750	Iron
Translucent Obsidian	Strong	247 SI	Iron
Transparent Obsidian (black)	Weak to Moderate	74 -95	Iron
Transparent Obsidian (near-colorless)	Weak	22 SI	Iron
<b>Opal</b>			
Prescious 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 (Yellow, Orange)	Weak	<20- 39	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	Not Tested	Light Diffraction, Iron in the Host Matrix
<b>Pearl</b>	Inert	< 0 (diamagnetic)	Organic
<b>Pectolite</b> (blue Larimar)	Inert	< 0 (diamagnetic)	Copper
<b>Peridot</b>			
Green Peridot with saturated color	Drags	417-590	Iron
Near-colorless Peridot (Forsterite)	Weak	52 SI	Iron
<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>Pyrrhotite</b>	Picks Up	Ferromagnetic	Iron
<b>Quartz (macro-crystalline)</b>			
Amethyst	Inert	< 0 (diamagnetic)	Charge Transfer 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
Rose Quartz	Inert	< 0 (diamagnetic)	Microscopic Inclusions, Color Centers, Charge Tran.
Smoky Quartz	Inert	< 0 (diamagnetic)	Color Centers
<b>Quartz with Inclusions</b>			
Rutile, Hematite & Most Other Inclusions	Inert	< 0 (diamagnetic)	Varies with type of Inclusions
Tourmalinated Quartz	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
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, Crocidolite Macro Inclusions
Hawk's Eye	Weak	< 20	Iron oxide, Crocidolite Macro Inclusions
Pietersite	Inert to Strong	< 0-305 (varies with iron)	Iron Oxide, Crocidolite 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/Purple Chalcedony	Inert	< 0 (diamagnetic)	Light Scattering
Fire Agate	Picks Up	3975 SI	Iron, light scattering

<b>Chrome Chalcedony (Mtorolite)</b>	Inert to Weak	< 20 SI	Chromium in Microscopic Chrom. Oxide Inclusions
<b>Myrickite (Agatized Cinnabar)</b>	Strong	Varies within the stone	Mercury, Inclusions with Iron and/or Manganese
<b>Onyx</b>	Inert	< 0 (diamagnetic)	Iron in Microscopic Iron Oxide Inclusions
<b><u>Quartzite</u></b>			
Aventurine Quartz	Inert to Weak	< 0-27	Chromium, Iron
<b>Rhodochrosite</b>	Picks Up	3515-5269 SI	Manganese
<b>Rhodonite</b>	Picks Up	3610-4288	Manganese, Iron
<b>Richterite (blue opaque)</b>	Moderate	113 SI	Iron, Titanium
<b><u>Rutile</u></b>			
Opaque Metallic Gray	Strong	122 SI	Iron, Titanium
Transparent Red	Strong	327 SI	Iron, Titanium
<b>Synthetic Rutile (transparent colorless)</b>	Inert to Very Weak	< 0 (diamagnetic)	Rare-earth Metals
<b>Scapolite (yellow, purple)</b>	Inert	< 0 (diamagnetic)	Color Centers
<b>Selenite (colorless)</b>	Inert	< 0 (diamagnetic)	N/A
<b>Scheelite (transparent yellow)</b>	Inert	< 0 (diamagnetic)	Iron
<b>Seraphinite (Clinocllore)</b>	Moderate	126 SI	Iron
<b><u>Serpentine</u></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>Shell</b>	Inert	< 0 (diamagnetic)	Organic
<b>Siderite (transparent)</b>	Picks Up	4,924 SI	Iron
<b><u>Sillimanite</u></b>			
Green/ Yellow Sillimanite	Weak	35-52 SI	Iron, Chromium
Fibrolite (gray Sillimanite)	Weak	< 20	Charge Transfer?
<b>Silver (native element)</b>	Inert	< 0 (diamagnetic)	Silver
<b><u>Sinhalite</u></b>			
Yellow/Brown	Weak to Strong	78 SI	Iron, Charge Transfer involving Iron
Brown	Strong	148-152 SI	Iron
<b><u>Smithsonite</u></b>			
Pink Smithsonite	Inert	< 0 (diamagnetic)	Cobalt, Manganese
Blue Smithsonite	Weak	< 20	Copper
Green Smithsonite	Moderate to Strong	No Data	Copper
Yellow Smithsonite	Weak	43 SI	Cadmium, Iron
<b><u>Sodalite</u></b>			
Sodalite (translucent to opaque)	Inert to Weak	< 0-48	Color Centers
Hackmanite (transparent)	Inert	< 0 (diamagnetic)	Color Centers
<b>Sphalerite (orange, yellow)</b>	Inert	< 0 (diamagnetic)	Iron-Sulfur Charge Transfer
<b><u>Sphene (Titanite)</u></b>			
Yellow/Brown Sphene	Weak to Strong	30-78	Rare-earth Elements, Iron
Green Sphene	Weak	35-52	Chromium, Rare-earth Metals, Iron
<b><u>Spinel</u></b>			
Cobalt	Weak to Strong	48-182 SI	Cobalt

Pale Spinel colors	Inert to Weak	< 0-48	Cobalt, Iron, Chromium
Pink, Purple, Red, Blue, Black Spinel (transparent)	Weak to Moderate	48-104	Cobalt, Iron, Chromium
Hercynite Black Spinel (opaque)	Drags to Picks Up	1263-1328	Iron
<b>Synthetic Spinel</b>			
Synthetic Spinel (blue, pink, most colors)	Inert (blue is weak in rare cases)	< 0 (diamagnetic)	Cobalt, Chromium, Magnanese
Synthetic Red Spinel	Weak	< 20	Chromium, Cobalt
Synthetic Green Spinel (blue-green, neon green)	Inert to Moderate	< 0-122	Manganese, Chromium
<b>Spodumene</b>			
Kunzite (pink, purple, some fading)	Inert	< 0 (diamagnetic)	Manganese
Pale Yellow/Green Spodumene (fades in light)	Inert to Weak	< 0 -56	Manganese, Iron-Iron Charge Transfer
Hiddenite (pale green, permanent color)	Weak	65 SI	Chromium, Iron
<b>Staurolite</b>			
Transparent Staurolite	Picks Up	927-1054	Iron
Opaque Staurolite	Drags	890 SI	Iron
<b>Strontium Titanite</b> (colorless)	Inert	< 0 (diamagnetic)	None
<b>Sugilite</b>	Drags to Picks Up	556-950	Manganese, Iron
<b>Taaffeite</b> (transparent purple)	Strong	135 SI	Iron, Chromium
<b>Tantalite</b>	Picks Up	No Data	Manganese
<b>Titanium</b> (native element)	Weak	No Data	Titanium
<b>Topaz</b>			
Blue, Pink, Sherry, Brown, Green Topaz	Inert	< 0 (diamagnetic)	Color Centers, Chromium
Imperial Topaz	Inert	< 0 (diamagnetic)	Color Centers, Chromium
<b>Tortoise Shell</b>	Inert	< 0 (diamagnetic)	Organic
<b>Tourmaline Group</b>			
<b>Dravite/Uvite</b>			
Brown, Pinkish Brown, Orangey Brown, Yellow	Inert	< 0 (diamagnetic)	Iron-Titanium Charge Transfer
Yellow	Inert	< 0 (diamagnetic)	Iron-Titanium Charge Transfer, Manganese
Dark Green Chrome Dravite	Inert	< 0 (diamagnetic)	Vanadium, Chromium
Pale Green Vanadian Dravite	Inert	< 0 (diamagnetic)	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	<20-443	Manganese-Titanium Charge Transfer, Mn., Iron
Paraiba: Blue	Inert-Strong	<0-286	Copper, Manganese
Paraiba: Green	Weak-Drag	17-386	
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	87 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>Schorl</b>			
Black (opaque)	Drags	773-990 SI	Iron, Mang., Titanium, Iron-Iron Charge Transfer
<b>Triphylite</b> (transparent)	Picks Up	3289 SI	Iron, Manganese
<b>Triplite</b> (transparent)	Picks Up	4,706 SI	Manganese, Iron
<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>	Inert to Moderate	< 0-117	Chromium, Iron
<b>Vivianite</b>	Picks Up	1766 SI	Iron
<b>Wulfenite</b> (orange)	Inert	< 0 (diamagnetic)	Charge Transfer involving Chromium & Oxygen
<b>Xenotime</b>	Picks Up	No Data	Rare-earth Metals
<b>Zincite</b> (red, yellow)	Inert	< 0 (diamagnetic)	Manganese, Iron
<b>Zircon</b> (any color)	Inert	< 0 (diamagnetic)	Color Centers, Uranium (blue)
<b>Zoisite</b>			
Tanzanite (blue, green, brown)	Inert	< 0 (diamagnetic)	Vanadium, Chromium (green)
Tanzanite (pink)	No Data	No Data	Manganese
Thulite (opaque pink)	Picks Up	3454 SI	Manganese



|

|

|

|

\_\_\_\_\_

|

|

|

\_\_\_\_\_

\_\_\_\_\_





|

|



| \_\_\_\_\_