

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.

Magnetic Susceptibility Range

Gemstone	Magnetic Response Range	SI X 10 (-6)	Cause of Color
Actinolite			
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
Afghanite (blue)	Inert	< 0 (diamagnetic)	Chromium, Vanadium
Alexandrite (see Chrysoberyl)			
Almandine (see Garnet)			
Amazonite (see Feldspar)			
Amber (any color)	Inert	< 0 (diamagnetic)	Charge Transfer involving Organic Compounds
Amblygonite-Montebbrasite Series (blue, green)	Inert	< 0 (diamagnetic)	Iron, Manganese
Amethyst (see Quartz)			
Andalusite			
Brownish green	Inert to Weak	< 0 -26	Iron-Oxygen-Titanium Charge Transfer
Viridine (mangan-Andalusite, dark green)	Moderate	100 SI	Manganese, Iron
Andradite (see Garnet)			
Anglesite (transparent yellow)	Inert	< 0 (diamagnetic)	Sulfur?
Apatite			
Blue, green Apatite	Inert (rarely Weak)	< 0 (diamagnetic)	Rare Earths, Mang., Charge Transfer, Color Cent.
Chrome green Apatite	Inert	< 0 (diamagnetic)	Chromium
Yellow, yellowish brown Apatite	Weak to Strong	< 20 - >120	Neodymium/Praseodymium
Purple Apatite	Inert to Weak	0- < 20	Manganese
Aquamarine (see Beryl)			
Astrophyllite	Strong	1146-1328	Iron, Manganese
Axinite			
Ferroaxinite (brown, bluish brown)	Drags	603-654	Iron, Vanadium (blue)
Manganaxinite (yellow, brown)	Drags	345-404	Manganese, possibly Charge Transfer
Manganaxinite (opaque black end member)	Drags	998 SI	Manganese
Magnesoaxinite (near-colorless end member)	Weak	17 SI	Magnesium (colorless)

Azurite (opaque)	Strong	382 SI	Copper
Barite (light brown, blue)	Inert	< 0 (diamagnetic)	Color Centers
Bastnasite (light brown to dark reddish brown)	Drags (Picks Up under 1ct)	654-898	Cerium, Neodymium, Praseodymium
Benitoite	Inert	< 0 (diamagnetic)	Iron-Titanium Charge Transfer
Beryl			
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 (light blue to medium blue)	Weak to Moderate	20-100	Iron (Fe2+), Iron-Iron Charge Transfer
Synthetic Aquamarine	Moderate	109 SI	Iron
Blue Beryl (Maxixe)	Inert	< 0 (diamagnetic)	Color centers
Golden Beryl/ Yellow Beryl	Inert to Weak	< 0-48	Iron (Fe3+), 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
Bismuth (native metal)	Inert	< 0 (diamagnetic)	Bismuth
Brazilianite (transparent greenish yellow)	Inert	< 0 (Diamagnetic)	Iron, possibly Color Centers
Bumblebee "Jasper" (mineral aggregate)	Moderate to Strong	Varies within the stone	Sulfur, Arsenic, Hematite
Bustamite (translucent)	Picks Up	2,995 SI	Manganese
Calcite			
Most Calcite Colors	Inert	< 0 (diamagnetic)	Iron, Manganese, Zinc
Pink Cobarito Calcite	Weak	22-26	Cobalt
Carneilian (see Quartz)			
Cassiterite (colorless, light yellow)	Inert	< 0 (diamagnetic)	Iron
Cavansite (stabilized cab)	Moderate	> 82	Vanadium
Celestite (blue)	Inert	< 0 (diamagnetic)	Color Centers
Charoite	Weak	56-69	Manganese
Chondrodite	Inert	< 0 (diamagnetic)	Iron, Manganese
Chrome Diopside (see Diopside)			
Chromite (see Spinel)			
Chrysoberyl			
Chrysoberyl	Weak to Moderate	20-127	Iron, Chromium
Alexandrite	Weak	43-52	Chromium
Synthetic Alexandrite	Inert	< 0 (diamagnetic)	Chromium, Vanadium
Chrysocolla	Moderate to Strong	104-239	Copper
Chrysoprase (see Quartz)			
Citrine (see Quartz)			
Clinohumite			
Red Clinohumite	Weak	65 SI	Iron, Manganese
Orange Clinohumite	Strong	334 SI	Manganese, Iron

Clinozoisite	Drags	373 SI	Iron, Chromium
Cobaltite (purity unknown)	Strong	No Data	Cobalt, Arsenic
Copper			
Pure Copper	Inert	< 0 (diamagnetic)	Copper
Native Copper (with impurities)	Strong	No Data	Copper (and impurities)
Coral	Inert	< 0 (diamagnetic)	Organic Pigments
Corundum			
Ruby	Weak to Moderate	<20-48 (sometimes 78-113)	Chromium, Vanadium, Iron
Synthetic Ruby (red corundum)	Inert to Weak	< 0-17	Chromium, Titanium
Sapphire			
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
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
Chrome Diopside (see Diopside)			
Cubic Zirconia (CZ)			
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
Cuprite (transparent to opaque)	Weak	74 SI	Band Gap process
Danburite (yellow)	Inert	< 0 (diamagnetic)	Neodymium, Praseodymium
Demantoid (see Garnet)			
Diamond			
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
Diaspore	Weak	39-48	Manganese, Iron, Chromium
Diopside			
Black Star Diopside	Picks Up	8,925- 9,960 Ferrimagnetic	Iron in Needle Inclusions of Magnetite
Chrome Diopside (light 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
Dioptase	Strong to Drags	282-327	Copper
Dolomite (transparent yellow/brown)	Inert	< 0 (diamagnetic)	Iron
Dumortierite	Weak	< 20	Various

Dunilite (see Olivine)			
Ekanite (transparent green)	Weak	< 20	Iron, (radioactive due to Thorium)
Emerald (see Beryl)			
Enstatite			
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 (green)	Strong	282 SI	Vanadium, Chromium, Iron
Eosphorite	Picks Up	2365 SI	Manganese, Iron
Epidote	Drags	491 SI	Iron
Euclase (light blue, yellowish green)	Inert	< 0 (diamagnetic)	Iron to Iron Charge Transfer
Eudialite (transparent to opaque)	Strong to Drags	345-469	Manganese, Iron
Feldspar Group			
Andesine Feldspar			
Untreated Andesine (yellow, reddish brown)	Weak	< 20	Iron, Copper
Diffused Andesine (red & green)	Weak	< 20	Copper, Iron
Bytownite Feldspar	Weak	35 SI	Iron
Labradorite Feldspar			
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
Microcline Feldspar			
Amazonite (green, blue, opaque or transparent)	Inert	< 0 (diamagnetic)	Color Centers involving Lead
Oligoclase Feldspar			
African Sunstone (with Hematite, African & Indian)	Inert	< 0 (diamagnetic)	Iron (Hematite Inclusions)
Light green Oligoclase	Inert	< 0 (diamagnetic)	No Data
Orthoclase Feldspar			
Moonstone Orthoclase	Inert	< 0 (diamagnetic)	Light Scattering
Yellow ("Noble") Orthoclase	Weak to Moderate	65-104	Iron
Sanidine Feldspar	Moderate	No Data	Iron
Fluorite (any color)	Inert	< 0 (diamagnetic)	Color Centers (mostly)
Gadolinite (opaque)	Picks Up	8,780 SI	Iron, Beryllium, Rare Earth Metals
Garnet Group			
Almandine Garnet	Picks Up	1871-3094	Iron
Andradite Garnet			
Demantoid Garnet	Picks Up	2180-2752	Iron, Chromium/Vanadium
Brown Andradite & Topazolite Garnet	Picks Up	2559-2907	Charge Transfer involving Iron
Melanite (black) Garnet	Picks Up	1866 SI	Charge Transfer involving Iron
Irridescent Andradite Garnet	Picks Up	2930 SI	Light Diffraction (Interference Colors)

Grossular Garnet			
Hessonite Garnet(light to dark yellow/orange)	Moderate to Strong (Drag is possible)	91-321	Manganese (Mn ²⁺), Charge Transfer involving Iron
Hydrogrossular Garnet (green, pink, red)	Weak to Strong	74-339	Iron, Chromium/Vanadium, Manganese
Mali Garnet (any color)	Drags	291-1099	Iron
Green Grossular (including Tsavorite & Merelani)	Weak to Strong	20-309	Chromium/Vanadium, Iron
Rosolite Garnet (pink)	Strong	113-147	Manganese (Mn ³⁺)
Near-Colorless and Colorless (Leuco) Grossular	Weak to Moderate	15-127	Chromium/Vanadium, Manganese, Iron
Pyrope Garnet			
Standard Pyrope Garnet	Picks Up	1163-1971	Iron, Chromium/Vanadium
Rhodolite Garnet	Picks Up	1007-1890	Iron, Chromium/Vanadium
Malaya Garnet (any color)	Picks Up	1127-2689	Manganese, Chromium/Vanadium, Iron
Chrome Pyrope Garnet	Drags to Picks Up	454-999	Chromium, Iron
Pastel Pyrope Garnet	Drags to Picks Up	618-1236	Manganese, Chromium/Vanadium, Iron
Color-Change Pyrope Garnet	Picks Up	1445-2326	Manganese, Iron, Chromium/Vanadium
Spessartine Garnet			
Spessartine Garnet	Picks Up	4301-4728	Manganese, some Iron
Color-Change Spessartine Garnet	Picks Up	2435-4179	Manganese, Iron, Chromium/Vanadium
Malaya Garnet (any color)	Picks Up	2734-3325	Manganese, Iron, Chromium/Vanadium
Uvarovite Garnet	Drags	909-998	Chromium/Vanadium
Synthetic Garnet			
GGG (Gadolinium Gallium Garnet) Any Color	Picks Up	6219-7404	Gadolinium (colorless) and Various Dopants
SGG (Samarium Gallium Garnet) yellow	Strong	291 SI	Samarium
Yellow YAG (Yttrium Aluminum Garnet)	Inert to Weak	< 0-35	Various Dopants
Green YAG (Yttrium Aluminum Garnet)	Inert to Strong	< 0-339	Chromium, Rare Earths
Pink YAG (Yttrium Aluminum Garnet)	Strong to Drags (rarely Picks Up)	356-391 (rare 5433)	Manganese (rarely Erbium)
Violet YAG (Yttrium Aluminum Garnet)	Weak to Moderate	30-126	Neodymium
Gaspeite	Strong	859 SI	Nickel, Iron
Glass (man-made)			
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
Gold (pure 24k)	Inert	< 0 (diamagnetic)	Gold
Grandidierite (translucent)	Weak	<20-35 SI	Iron, possibly Charge Transfer involving Iron
Hackmanite (see Sodalite)			
Hauyne	Weak	No Data	Color Centers
Hematite (natural black and Specular)	Drags to Picks Up	2604-6853	Iron
Hemetine (imitation Hematite)	Picks Up	> 86,000 Ferromagnetic	Iron
Hemimorphite (blue)	Inert	< 0 (diamagnetic)	Copper
Hessonite (see Garnet)			
Herderite (transparent light orange)	Inert	<0 (diamagnetic)	No Data, possibly Charge Transfer or Color Centers

Howlite (white or dyed)	Inert	< 0 (diamagnetic)	None or Man-made Dyes
Idocrase/Vesuvianite (green)	Strong	217-233	Iron
Indicolite (see Tourmaline)			
Iolite	Moderate-Strong	105-200	Iron, Iron-Iron Charge Transfer
Iron (native element)	Picks Up	Ferromagnetic	Iron
Ivory	Inert	< 0 (diamagnetic)	Organic
Jadeite Jade			
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
Jeremejevite (blue)	Inert	< 0 (diamagnetic)	Charge Transfer involving Iron
Jet	Inert	< 0 (diamagnetic)	Organic Carbon
Johachidolite	Inert	< 0 (diamagnetic)	Not Known
Kornerupine			
Blue Kornerupine	Weak	< 20	Vanadium
Brownish green Kornerupine	Moderate to Strong	100-282	Iron, Vanadium
Green Kornerupine	Moderate	91 SI	Iron, Chromium, Vanadium
Kunzite (see Spodumene)			
Kyanite			
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
Labradorite (see Feldspar)			
Lapis Lazuli	Inert	< 0 (diamagnetic)	Charge Transfer involving Sulfur
Larimar (see Pectolite)			
Lazulite (transparent blue)	Weak to Strong	No Data	Iron-Iron Charge Transfer
Libyan Desert Glass (natural glass)	Inert	< 0 (diamagnetic)	Iron
Magnesite (transparent gray)	Drags	985 SI	Iron
Magnetite (see Spinel)			
Malachite	Drags	477 SI	Copper
Maw Sit Sit	Moderate to Strong	139-230	Chromium, Iron
Moissanite (man-made, colorless, light colors)	Inert	< 0 (diamagnetic)	Color Centers involving Nitrogen, Boron, Aluminum
Moldavite (natural glass)	Weak	69 SI	Iron
Moonstone (see Feldspar)			
Morganite (see Beryl)			
Muscovite/Mica			
Lepidolite (lavender)	Inert	< 0 (diamagnetic)	Lithium
Fuchsite	Weak	< 20-69	Chromium, Iron

Nephrite Jade (see Actinolite)			
Nicolite	Moderate	No Data	Nickel, Arsenic
Nummrite (Anthophyllite with Gedrite)	Drags	1094 SI	Light Diffraction in black matrix, Iron
Orpiment (yellow)	Inert	< 0 (diamagnetic)	Sulfur (also contains Arsenic)
Obsidian (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
Olivine Group			
Forsterite			
Yellowish green Peridot (typical color)	Drags	417-590	Iron
Greenish yellow Peridot (rare color)	Drags	534 SI	Iron
Near-colorless Peridot (rare color)	Weak	52 SI	Iron
Dunilite (brownish green Forsterite/Fayalite)	Picks up	1435 SI	Iron
Synthetic blue Forsterite	Weak	< 20	Chromium
Onyx (see Quartz)			
Opal			
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
Yellowish green "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
Pargasite (see Actinolite)			
Parisite	Drags	345 SI	Cerium, Neodymium, Praseodymium
Pearl	Inert	< 0 (diamagnetic)	Interference Colors, Charge Transfer
Pectolite (blue Larimar)	Inert	< 0 (diamagnetic)	Copper
Peridot (see Olivine Group)			
Pezzottaite (see Beryl)			
Plastic (any color)	Inert	< 0 (diamagnetic)	Various
Platinum	Strong	No data	Platinum
Prehnite (green)	Weak to Moderate	26-122	Iron
Psilomelane	Strong to Drags	343-1007	Manganese
Purpurite (translucent to opaque)	Drags to Picks Up	? - 1502	Manganese, Iron
Pyrite	Weak	43 SI	Iron-Sulfur properties

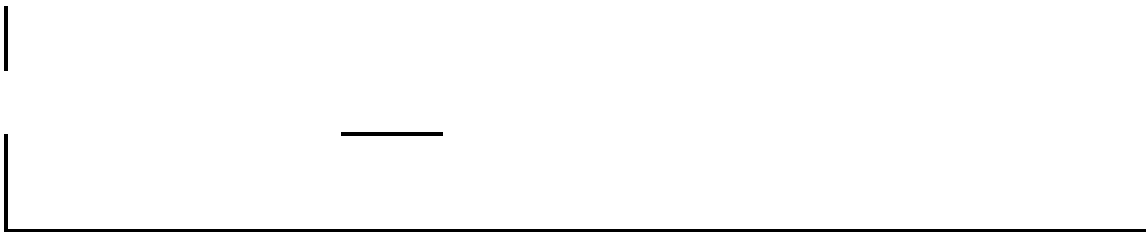
Pyromorphite (opaque)	Inert	< 0 (diamagnetic)	Copper, Iron
Pyrope (see Garnet)			
Pyroxymangite (transluc. dimorph of Rhodonite)	Picks Up	No Data	Manganese
Pyrrhotite	Picks Up	Ferromagnetic	Iron
Quartz (transparent, macrocrystalline)			
Amethyst	Inert	< 0 (diamagnetic)	Charge Transfer & Color Centers 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 Dopants
Quartz with Inclusions			
Quartz w/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 Tourmaline inclusions)	Weak	56 SI	Iron, Manganese In Micr. Incl. of blue Tourm.
Rose Quartz	Inert	< 0 (diamagnetic)	Microscopic Inclusions, Color Centers, Charge Tran.
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 (Fe3+), Limonite macro Inclusions
Hawk's Eye	Weak	< 20	Iron oxide (Fe2+), Limonite macro Inclusions
Chalcedony Quartz (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 (light green to medium green)	Inert to Strong	<0-224	Nickel in Microscopic Willemseite Inclusions
Gem Silica (Chrysocolla in Chalcedony) blue, green	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	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
Quartzite			
Aventurine Quartz (green)	Inert to Weak	< 0-27	Chromium in Fuchsite Mica inclusions
Rhodochrosite (opaque to transparent)	Picks Up	3515-5269	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)			
Rutile			
Opaque metallic gray Rutile	Strong	122 SI	Iron, Titanium
Transparent red Rutile	Strong	327 SI	Iron, Titanium
Synthetic Rutile (transparent colorless)	Inert to Very Weak	< 0 (diamagnetic)	None
Sapphire (see Corundum)			
Sapphirine	Weak to Moderate	73-95	Iron, Charge Transfer involving Iron
Scapolite (yellow, purple)	Inert	< 0 (diamagnetic)	Color Centers, Charge Transfer
Selenite (colorless)	Inert	< 0 (diamagnetic)	N/A
Scheelite (transparent yellow)	Inert	< 0 (diamagnetic)	Neodymium
Seraphinite (Clinochlore)	Moderate	126 SI	Iron
Serpentine			
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
Shattuckite	Strong	256-286	Copper
Shell	Inert	< 0 (diamagnetic)	Organic Compounds
Siderite (transparent)	Picks Up	4,924 SI	Iron
Sillimanite			
Green, Yellow Sillimanite	Weak	35-52	Iron, Chromium
Fibrolite (bluish gray Sillimanite)	Weak	< 20	possibly Charge Transfer
Silver (native element)	Inert	< 0 (diamagnetic)	Silver
Sinhalite			
Yellowish brown Sinhalite	Weak to Strong	78 SI	Iron, Charge Transfer involving Iron
Brown Sinhalite	Strong	140-152	Iron
Smithsonite			
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
Sodalite			
Sodalite (translucent to opaque)	Inert to Weak	< 0-48	Color Centers
Hackmanite (transparent Sodalite)	Inert	< 0 (diamagnetic)	Color Centers
Spessartine (see Garnet)			
Sphalerite (orange, yellow, green)	Inert	< 0 (diamagnetic)	Iron-Sulfur Charge Transfer, Cobalt (green)
Sphene (Titanite)			
Yellow, brown Sphene	Weak to Strong	30-78	Neodymium, Iron
Green Sphene	Weak	35-52	Chromium, Neodymium, Iron
Spinel Group			
Spinel (Magnesium Spinel)			
Blue (light blue to dark blue) Spinel	Weak to Strong (Drag is rare)	35-200 (360 rare)	
Cobalt ("electric" blue) Spinel	Weak to Moderate	55-91	Cobalt, Iron

Red Spinel	Weak to Strong	17-139	Chromium, Iron
Pink (light pink to vivid pink) Spinel	Inert to Strong	< 0-165	Chromium, Iron
Purple Spinel	Weak	22-56	Chromium, Cobalt, Iron
Gray (bluish, pinkish) Spinel	Weak	35-61	primarily Iron
Orange, pinkish orange Spinel	Inert-Weak	< 0-<20	Chromium, Iron
Green (bluish, grayish) Spinel	Weak	42-48	Iron, Iron-Iron Charge Transfer
Near-colorless (pinkish, grayish) Spinel	Inert to Weak	< 0-17	None
Gahnite (transparent dark green Zinc Spinel)	Strong	218 SI	Iron-Iron Charge Transfer
Hercynite (opaque black Iron Spinel)	Drags to Picks Up	1263-1328	Iron
Magnetite (opaque black Spinel)	Picks Up	Ferrimagnetic	Iron
Chromite (opaque black iron-chromium Spinel)	Drags	No Data	Iron, Chromium
Synthetic Spinel			
Synthetic Blue Spinel (flame-fusion)	Inert (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
Spodumene			
Kunzite (pink, purple)	Inert	< 0 (diamagnetic)	Manganese, Color Centers
Light yellow, green Spodumene	Inert to Weak	< 0 -56	Manganese, Iron-Iron Charge Transfer, Color Cntrs
Hiddenite (light green, color stable)	Weak	< 20 -65	Chromium, some Manganese
Staurolite			
Transparent Staurolite	Picks Up	927-1054	Iron
Opaque Staurolite	Drags	890 SI	Iron
Strontium Titanate (colorless or yellow)	Inert	< 0 (diamagnetic)	None, or Manganese (yellow)
Sunstone (see Feldspar)			
Sugilite			
Opaque Massive Sugilite	Drags to Picks Up	556-950	Manganese, Iron
Translucent Sugilite	Strong	170 SI	Manganese, Iron
Taaffeite (transparent purple)	Strong	135 SI	Iron, Chromium
Tantalite			
Ferrotantalite (gray)	Picks Up	No Data	Iron, Manganese
Manganotantalite (red)	Picks Up	2808 SI	Manganese, Iron
Thulite (see Zoisite)			
Titanium (native element)	Weak	No Data	Titanium
Topaz			
Blue, pink, sherry, brown, green, yellow Topaz	Inert	< 0 (diamagnetic)	Color Centers, Chromium
Imperial Topaz (reddish orange)	Inert	< 0 (diamagnetic)	Color Centers, Chromium
Tortoise Shell	Inert	< 0 (diamagnetic)	Organic Compounds
Tourmaline Group			
Dravite Tourmaline			
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
Elbaite Tourmaline			
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 (light green) Tourmaline	Weak to Moderate	43- 260	Iron, Iron-Titanium Charge Transfer
Yellow, greenish yellow, brownish yellow	Weak to Drags	<20-512	Manganese-Titanium Charge Transfer, Mn2+, Iron
Paraiba Tourmaline: blue	Inert to Strong	<0-286	Copper, Manganese
Paraiba Tourmaline: green	Weak to Drag	17-386	Copper, Manganese
Indicolite: blue/greenish blue (medium to dark)	Drags	304-447	Iron, Iron-Iron Charge Transfer
Blue Tourmaline (light blue)	Strong	55-254	Iron
Purple Tourmaline (light lilac)	Moderate to Strong	87 -213	Manganese
Rubellite Tourmaline (red)	Inert to Moderte	< 0-78	Manganese (Mn3+), Color Centers
Pink, purplish pink Tourmaline	Inert to Moderate	< 0-156	Manganese (Mn3+), Iron
Reddish brown, pinkish brown, pinkish orange	Weak to Drags	< 20- 547	Manganese, Iron
Gray (transparent), purplish gray, bluish gray	Drags	469-529	Iron, Mang., Titanium, Iron-Iron Charge Transfer
Rossmanite Tourmaline			
Pinkish purple (translucent)	Weak	< 20	Manganese
Schorl Tourmaline			
Black (opaque)	Drags	773-990	Iron, Mang., Titanium, Iron-Iron Charge Transfer
Uvite Tourmaline			
Brownish red Uvite	Strong	218-243	Iron
Yellowish green Uvite	Inert	< 0 (diamagnetic)	Chromium, Vanadium
Tanzanite (see Zoisite)			
Triphylite (transparent)	Picks Up	3289 SI	Iron, Manganese
Triplite (transparent orange)	Picks Up	4,706-4,982	Manganese
Tsavorite (see Garnet)			
Tugtupite	Inert	< 0 (diamagnetic)	Color Centers
Turquoise			
Blue Turquoise	Weak to Moderate	26-135	Copper
Green Turquoise	Weak to Strong	35-278	Copper, Iron
Variscite			
Variscite (green)	Inert to Moderate	< 0-117	Chromium, Iron
Metavariscite (chrome green)	Inert	< 0 (diamagnetic)	Chromium
Vesuvianite (see Idocrase)			
Viridine (see Andalusite)			
Vivianite	Picks Up	1766 SI	Iron
Wulfenite (orange, colorless)	Inert	< 0 (diamagnetic)	Charge Transfer involving Chromium & Oxygen
Xenotime	Picks Up	No Data	Erbum, Holmium
YAG (see Garnet)			
Zincite (red, yellow)	Inert	< 0 (diamagnetic)	Manganese, Iron
Zircon			
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
Zoisite			
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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