

GEM MATERIAL	COLORS	TRANSPARENCY	VISUAL CHARACTERISTICS	REFRACTIVE INDEX			Op. Char, Crystal Sys	PLEOCHROISM	VARIETIES	SPECTRUM	UV FLUOR	SPECIFIC GRAVITY	HARDNESS	COMMENTS
				RI (norm)	Range	Biref								
Hematite	G,Bl	Opaque	Metallic luster	2.940-3.220	-0.07	0.26	AGG, Hexagonal					5.20; +0.08, -0.25	5½ to 6½	Streak test- reddish brown
Diamond	All colours	Tr to opaque	Adamantine luster	2.417			SR, Cubic		415.5 in cape series	LW-in to str, SW-in	3.52 ±0.01	10	High thermal conductivity	
Ice	All colours	Tr	Strong dispersion	2.15	0.03		SR, Cubic			LW&SW-in to mod	5.8 ±0.02	8½		
Sphene	O, Y, G, Br	Tr	Very strong doubling	1.900-2.034	±0.020	0.1-0.135	DR, B+, Monoclinic	Tri, mod to strong		580 doublet	LW&SW-inert	3.52 ±0.02	5 to 5½	
Zircon	C, P, R, O, Y, G, B, Br	Tr to S-Tr	(rare) Subadamantine luster	1.925-1.984	0.04, -0.145	0.00 to 0.059	DR, U+, Tetragonal	Di, weak to strong		653.5 line	LW&SW-in to mod	4.7; 0.03, -0.80	6 to 7½	Abraded facet edges, doubling
Andradite	Y, G, Br, Bl	Tr to opaque	(rare)	1.888	0.007, -0.093		SR, Cubic	Demantoid, Melanite	440.0 line	LW&SW-inert	3.84 ±0.03	6½ to 7	Horse tail inclusions	
Spessartite	R, O, Br	Tr	Color contains some orange	1.81	0.004, -0.02		SR, Cubic		412, 430 bands key	LW&SW-inert	4.15; 0.05, -0.03	7 to 7½		
Almandite	P, R, Br	Tr to S-Tl	A, often dark in tone	1.79	±0.030		SR, Cubic		505, 525, 575 bands	LW&SW-inert	4.05; 0.25, -0.12	7 to 7½	Needle-like incls intersect at 70° and 110°	
Corundum	All colours	Tr to opaque	A, CC, C (rare)	1.762-1.770	0.009, -0.005	0.008 - 0.010	DR, U-, Trigonal	Di, weak to strong	Ruby, Sapphire	varies with color	LW&SW-in to strong	4.00; 0.10, -0.05	9	silk (rutile) intersecting at 60° and 120°
Syn. Corundum (F)	All colours	Tr to opaque	A, CC, C (rare)	1.762-1.770	0.005, -0.003	0.008	DR, U-, Trigonal	Di, weak to strong	Ruby, Sapphire	varies with color	LW&SW-in to strong	4.00; ±0.03	9	gas bubbles, curved striations
Syn. Corundum (F)	All colours	Tr		1.762-1.770		0.008	DR, U-, Trigonal	Di, mod to strong	Ruby, Sapphire	varies with color	LW&SW-in to strong	4.00; ±0.03	9	flux, flux fingerprint, metallic inclusions
Rhodolite	P, R	Tr	Purple to purplish red color	1.76	0.010, -0.020		SR, Cubic			505, 525, 575 bands	LW&SW-inert	3.84; ±0.01	7 to 7½	
Chrysoberyl	P, R, Y, G, B, Br	Tr to opaque	C, CC	1.746-1.755	0.004, -0.006	0.008 -0.010	DR, B+, Orthorhombic	Tri, weak to strong	Alexandrite, cat's eye	varies with color	LW&SW-in to weak	3.73; ±0.02	8½	Syn Alexandrite has slightly lower RI and stronger fluo than nat.
Pyrope	R	Tr	often very dark in tone	1.746	0.010, -0.026		SR, Cubic			505, 560 broad bands	LW&SW-inert	3.78; 0.09, -0.16	7 to 7½	
Grossularite	O, Y, G, Br	Tr to S-Tr		1.74	0.020, -0.010		SR, Cubic	Hessonite, Tsavorite	varies with color	LW&SW-inert to mod	3.61; 0.12, -0.04	7 to 7½	Hessonite-Heat wave effect	
Azurite	B	Tr-O		1.730-1.836	±0.010	0.106	AGG, Monoclinic	Tri, strong to mod				3.80; 0.09, -0.50	3½ to 4	generally associated with malachite, intergrowth called azurmalachite
Hydrogrossular	R, G, W, Gr	Tl-O		1.72	0.010, -0.030		AGG, Cubic			varies with color	LW&SW-inert	3.47; 0.08, -0.32	7	
Syn. Spinel	All colours	Tr-O	CC, Colorless, Light Y, G, B, dark B common	1.728	0.012, -0.008		SR, Cubic			varies with color	LW&SW-in to strong	3.64; 0.02, -0.12	8	
Spinel	All colours	Tr-O	CC, A (rare), colors often low in saturation	1.718	0.017, -0.008		SR, Cubic			varies with color	LW-in to str, SW-in	3.60; 0.10, -0.03	8	Octahedral crystals as inclusions
Kyanite	C, G, B,	Tr	C (rare)	1.716-1.731	±0.004	0.012-0.017	DR, B-, Triclinic	Tri, mod	cat's eye	435, 445 bands	LW-in to weak	3.68; 0.01, -0.12	4 to 7½	Directional hardness
Zoisite	R, G, B, V, Br, Gr	Tr-O	C (rare), very strong pleochroism	1.691-1.700	±0.005	0.008-0.013	DR, B+, Orthorhombic	Tri, strong	Tanzanite	varies with color	LW&SW-inert	3.35; 0.10, -0.25	6 to 7	
Diopside	G, B, V, Bl	Tr-O	A, C	1.675-1.701	0.029, -0.010	0.024-0.030	DR, B+, Monoclinic	Tri, weak to mod	cat's eye, star	505 line common		3.29; 0.11, -0.07	5½ to 6	cat's eye commonly green, star-4 rayed star commonly black
Enstatite	G, Br	Tr-Tl	C, A (rare), often dark in tone	1.663-1.673	±0.010	0.008-0.011	DR, B+, Orthorhombic	Tri, weak to strong		505, 550 lines	LW&SW-inert	3.25; 0.15, -0.02	5 to 6	
Spodumene	P, R, Y, G, B, V, Gr	Tr		1.660-1.676	±0.005	0.014-0.016	DR, B+, Monoclinic	Tri, weak to strong	Kunzite, Hiddenite	varies with color	LW-in to str, SW-weak	3.18; ±0.03	6½ to 7	Kunzite-pale pink, Hiddenite-pale green
Sillimanite	G, B, Br, W, Gr	Tr-O	C	1.659-1.680	0.004, -0.006	0.015-0.011	DR, B+, Orthorhombic	Tri, mod to strong				3.25; 0.2, -0.11	6 to 7½	generally fibrous, also known as fibrolite
Jadeite	All colours	S-Tr to O	often greasy to waxy luster	1.660 spot	±0.008		AGG, Monoclinic			437 line	LW&SW-in to strong	3.34; 0.06, -0.09	6 to 7½	
Malachite	G	O	banded with 2 or more tones of G	1.655-1.909		0.254	AGG, Monoclinic				LW&SW-inert	3.95; 0.15, -0.70	3½ to 4	curved or angular banding
Peridot	Y, G, Br	Tr		1.654-1.690	±0.020	0.035-0.038	DR, B+, Orthorhombic	Tri, weak to mod		457, 477, 497 lines	LW&SW-inert	3.34; 0.14, -0.07	6½ to 7	lily pad like inclusions
Andalusite	R, O, Y, G, Br, W, Gr, Bl	Tr-O	very strong pleochroism	1.634-1.643	±0.005	0.007-0.013	DR, B-Orthorhombic	Tri, strong		varies with color	LW-in, SW-in to mod	3.17; ±0.04	7 to 7½	var: chialtolite, Tl-O, with dark cross like pattern on Br material
Tourmaline	All colours	Tr-O	C, CC (rare), strong dichroism	1.624-1.644	0.011, -0.009	0.018-0.040	DR, U-, Trigonal	Di, weak to strong		varies with color	LW&SW-in to weak	3.06; 0.20, -0.06	7 to 7½	trichite inclusions, confused with andalusite, topaz and apatite
Apatite	C, P, R, Y, G, B, V, Br	Tr-Tl	C	1.634-1.638	0.012, -0.006	0.002-0.008	DR, U-, Hexagonal	Di, weak to strong		varies with color	LW&SW-in to weak	3.18; ±0.05	5	580 doublet in C, Y, ; confused with andalusite, tourmaline, topaz

COLOR: C Colorless, R Red, P Pink, O Orange, Y Yellow, G Green, B Blue, V Violet, W White, Br Brown, Gr Grey, Bl Black

TRANSPARENCY: T Transparent, S-Tr Semi-Transparent, Tl Translucent, S-Tl Semi-Translucent, O Opaque

PHENOMENA: A Asterism, Ad Adulrescence, Av Aventurescence, CC Color change, C Chatoyancy, I Irrididescence, L labradorescence, O Opalescence, P Play of color

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				RI (norm)	Range	Biref								
Topaz	P,R,O,Y,G,B,V,Br			1.619-1.627	±0.010	0.008-0.010	DR,B+,Orthorhombic	Tri, weak to mod			LW-in to weak	3.53;±0.04	8	incl-two immiscible liquids, RI varies with colour,Y,O,higher RI
Turquoise	B,G	S-TI to O	matrix possible	1.61			AGG,Triclinic			420,432 bands	LW-in to weak	2.76; 0.14,-0.36	5 to 6	may be dyed, Syn. Turquoise-cream of wheat
Nephrite	R,Y,G,Br,W,Gr,Bl	TI-O	Often greasy to waxy luster	1.61	0.009,-0.008		AGG, Monoclinic			500 line	LW&SW-inert	2.95; 0.15,-0.05	6 to 6½	tough, may be confused with jadeite
Rhodochrosite	R,W,Br,Gr	TP-O	pink and white banding in aggregate	1.597-1.817	±0.003	0.22	DR,U-,Hexagonal	Di, mod to strong		551 band	LW&SW-inert to mod	3.60; 0.10,-0.15	3½ to 4½	effervesces to HCl, TI-O-banded,bacon strip effect
Beryl	C,P,R,O,Y,G,B,Br,Gr	TP-O	C, A (rare)	1.577-1.583	±0.017	0.005-0.009	DR,U-,Hexagonal	Di, weak to strong	Emerald, Aquamarine etc.	varies with color	LW&SW-in to strong	2.72; 0.18,-0.05	7½ to 8	incl-2 phase, 3 phase, emerald may be oiled
Syn. Emerald (Hydro)	G	TP		1.568-1.573	0.008,-0.003	0.005-0.007	DR,U-,Hexagonal	Di, weak to strong		same as natural	LW&SW-in to strong	2.68; ±0.03	7½ to 8	nail head spicules, chevron growth,wispy incl, seed plate, fluoresces red
Syn. Emerald (Flux)	G	TP		1.561-1.564	0.01	0.003-0.008	DR,U-,Hexagonal	Di, weak to strong		same as natural	LW-in to st,SW in to mod	2.66; 0.03,-0.01	7½ to 8	flux incl may be wispy,metallic incl, phenakite xtl, st. growth
Serpentine	Y,G,Br,W,Bl	S-TP to O	waxy to greasy luster, resembles jade	1.560-1.570	0.004,-0.070		AGG,Monoclinic				LW-in to weak	2.57; 0.23,-0.13	2 to 6	poor polish, often shows scratches, confused with chalcedony
Coral (conchiolin)	Y,Br,Bl	S-TI to O	concentric circular (tree ring) structure	1.560-1.570	±0.010		AGG				LW&SW-inert	1.35; 0.77,-0.05	3	organic in origin
Labradorite	C,O,Y,G,B,Br,Gr,Bl	TP-O	Av,L,A,C (rare), L-often blue to green	1.559-1.568	±0.006	0.009	DR,B+,Triclinic	Tri, weak to mod			LW-inert to weak	2.70; ±0.05	6 to 6½	black, needle like inclusions, metallic appearing platelets
Tortoise shell	Y,Br,W,Bl	S-TP to TI	mottled coloration, resinous luster	1.55	-0.01		SR, Amorphous				LW&SW-in to strong	1.29; 0.06,-0.03	2½	organic in origin
Quartz	All colours	TP-O	A,Av,C,I	1.544-1.553	0	0.009	DR,U+,Trigonal	Di,weak to strong	Rock crystal, Amethyst etc.		LW&SW-inert to weak	2.65; 0.03,-0.02	7	polariscope-bull's eye; syn quartz-hydrothermal
Iolite	B,V,Br	TP-TI	A,Av,C (rare), strong trichroism	1.542-1.551	0.045,-0.011	0.008-0.012	DR,B-,Orthorhombic	Tri, mod to strong			LW&SW-inert	2.61; ±0.05	7 to 7½	often confused with amethyst, pleochroism key test
Ivory (elephant)	Y,Br,W	TI-O	engine turned effect, greasy to dull lustre	1.54	-0.005		AGG				LW&SW-weak to str blue	1.85; ±0.15	2½	effervesces to HCl, confused with other animal ivory
Amber	R,O,Y,G,B,V,Br,W	TP-O	resinous luster	1.54	0.005,-0.001		SR, Amorphous				LW-in to str, SW-weaker	1.08; 0.02,-0.08	2 to 2½	fossilised resin, insects and organic incl, resinous odor to hot point
Oligoclase	R,O,Y,Br,W,Gr	TP to S-TI	Av, orange sheen common	1.539-1.547	0.004,-0.006	0.007-0.010	AGG,DR,B-,Triclinic		Sunstone		LW&SW-inert to weak	2.64; 0.02,-0.03	6 to 6½	Feldspar; red or orange platy incl, confused with goldstone glass
Chalcedony	All colours	S-TP to O	I	1.535-1.539		0.000-0.004	AGG,Trigonal		Agate, Onyx etc		LW&SW-inert to mod	2.60; 0.10,-0.05	6½ to 7	may be banded,moss-like dendritic incl, dyed green and dyed blue
Pearl	All colours	TI-O	O, Dull to submetallic luster	1.530-1.685		0.155	AGG				LW&SW-inert to strong	2.71; 0.15,-0.09	2½ to 4	organic in origin, gritty to cutting edges of teeth, nat and cul-x-ray
Shell	All colours	TI-O	O	1.530-1.685		0.155	AGG				LW&SW-inert to mod	2.86; 0.03,-0.16	3½	organic in origin,e.g., mother- of-pearl
Microcline	O,G,B,W	TI-O	grid-like surface, often with sheen	1.533-1.530	±0.004	0.008	AGG,DR,B-,Triclinic		Amazonite		LW-in to weak, SW-weak	2.56; ±0.02	6 to 6½	Feldspar: grid-like intergrowth of bluish green and white
Orthoclase	C,O,Y,Br,W,Gr	TP to S-TI	A,Ad,C, vitreous to pearly luster	1.518-1.526	±0.010	0.005-0.008	DR,B-,Monoclinic	Tri, weak	Moonstone		LW&SW-inert to weak	2.58; ±0.03	6 to 6½	Feldspar: adularescence, centipede like incl
Lapis Lazuli	B,V	S-TI to O		1.670,1.500			SR, AGG				LW&SW-inert to mod	2.75; ±0.25	5 to 6	A Rock, essentially lazurite with white calcite, pyrite : HCl-rotten egg odor
Obsidian	All colours	TP-O	I,C (rare)	1.49	0.020,-0.010		SR, Amorphous		Natural Glass			2.40; 0.10,-0.07	5 to 5½	volcanic origin, may contain gas bubbles,crystallites, needles
Moldavite	G	TP to S-TP	low saturation common	1.49	0.020,-0.010		SR, Amorphous		Natural Glass		LW&SW-inert	2.36; ±0.04	5½	round and elongated gas bubbles, flow lines common
Calcite	All colours	TP-O	extreme doubling in single crystals	1.486-1.658		0.172	DR,U-,Trigonal				LW&SW-inert to mod	2.70; ±0.05	3	effervesces to HCl, massive varieties (marble, onyx marble)
Coral (calcareous)	R,O,W	S-TI to O	waxy parallel fibrous structure	1.486-1.658		0.172	AGG				LW&SW-inert to strong	2.70; ±0.05	3½ to 4	organic in origin, from polyps, effervesces to HCl
Sodalite	B,V	S-TP to O	commonly resembles lapis lazuli	1.483		±0.003	SR or AGG,Cubic				LW&SW-inert to weak	2.25; ±0.10	5 to 6	color more violet than lapis lazuli, white veining common, pyrite rare
Opal	All colours	TP-O	P,A,C (rare), may or may not have P	1.45	0.020,-0.080		SR,Amorphous				LW&SW-inert to strong	2.15; 0.08,-0.90	5 to 6½	syn opal shows snake skin pattern under magnification
Glass (Man-made)	All colours	TP-O	A,Ad,Av,C,CC,I,O,P	1.470 to 1.700			SR,Amorphous				LW&SW-inert to strong	2.30 to 4.50	5 to 6	gas bubbles, flow lines, warm to touch, may imitate any gemstone
Plastic	All colours	TP-O	A,Ad,Av,C,O,P	1.460 to 1.700			SR,Amorphous				LW&SW-inert to strong	1.30; ±0.25	1½ to 3	gas bubbles, flow lines, warm to touch, rounded facet junctions
Fluorite	All colours	TP-TI	CC	1.434	±0.001		SR or AGG, Cubic		Blue John		LW-in to strong, SW-weak	3.18; 0.07,-0.18	4	color zoning, 2 or 3 phase incl, often fluorescences

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PHENOMENA: A Adularescence, CC Color change, C Chatoyancy, I Irridescence, L Labradorescence, O Opalescence, P Play of color