

Refractive Indices and Double Refraction Values

The following table organizes gemstones from highest to lowest refractive indices.

Gemstone	Refractive Index	Double Refraction
Hematite	2.940-3.220	0.287
Cinnabar	2.905-3.256	0.351
Proustite	2.881-3.084	0.203
Pyrrargyrite	2.880-3.080	0.200
Cuprite	2.849	none
Rutile	2.616-2.903	0.287
Brookite	2.583-2.700	0.117
Anatase	2.488-2.564	0.046-0.067
Diamond	2.417-2.419	anomalous
Fabulite	2.409	none
Stibiotantalite	2.370-2.450	0.080
Sphalerite	2.368-2.371	none
Crocoite	2.290-2.660	0.270
Wulfenite	2.280-2.400	0.120
Tantalite	2.260-2.430	0.160
Linobate	2.210-2.300	0.090
Manganotantalite	2.190-2.340	0.150
Cubic zirconia (CZ)	2.150-2.180	none
Mimetite	2.120-2.135	0.015
Phosgenite	2.114-2.145	0.028
Senarmontite	2.087	none
Boleite	2.030-2.050	0.020
Zincite	2.013-2.029	0.016
Cassiterite	1.997-2.098	0.096-0.098
Simpsonite	1.994-2.040	0.058
Gadolinium gallium garnet (GGG)	1.970-2.020	0.058
Sulfur	1.958-2.245	0.291
Bayldonite	1.950-1.990	0.04
Scheelite	1.918-1.937	0.010-0.018
Andradite garnet	1.880-1.940	none
Anglesite	1.878-1.895	0.017
Uvarovite garnet	1.865	none
Purpurite	1.850-1.920	0.007
Sphene (titanite)	1.843-2.110	0.100-0.192
Yttrium aluminum garnet (YAG)	1.833-1.835	none
Zircon	1.810-2.024	0.002-0.059
Cerussite	1.804-2.079	0.274
Gahnite	1.791-1.818	none
Spessartite garnet	1.790-1.820	none
Painite	1.787-1.816	0.029
Monazite	1.774-1.849	0.049-0.055
Almandine garnet	1.770-1.820	none
Gadolinite	1.770-1.820	0.01-0.04
Ruby (corundum)	1.762-1.778	0.008
Sapphire (corundum)	1.762-1.778	0.008
Benitoite	1.757-1.804	0.047
Shattuckite	1.752-1.815	0.063
Chrysoberyl	1.746-1.763	0.007-0.011
Periclase	1.740	none
Scorodite	1.738-1.816	0.027-0.030
Staurolite	1.736-1.762	0.010-0.015
Grossular garnet	1.734-1.759	none
Chambersite	1.732-1.744	0.012
Hessonite garnet	1.730-1.757	none
Epidote	1.729-1.768	0.015-0.049
Pyroxmangite	1.726-1.764	0.016-0.020
Azurite	1.720-1.848	0.108-0.110
Pyrope garnet	1.720-1.756	none
Hodgkinsonite	1.719-1.748	0.022-0.026
Taaffeite	1.719-1.730	0.004-0.009
Rhodonite	1.716-1.752	0.010-0.014
Gahnspinel	1.715-1.754	none
Spinel	1.712-1.762	none
Kyanite	1.710-1.734	0.015-0.033
Adamite	1.708-1.760	0.048-0.050
Diaspore	1.702-1.750	0.048
Serendibite	1.701-1.743	0.005
Sapphirine	1.701-1.734	0.004-0.007
Aegirine-augite	1.700-1.800	0.030-0.050
Idocrase (vesuvianite)	1.700-1.723	0.002-0.012
Tanzanite	1.691-1.700	0.009
Neptunite	1.690-1.736	0.029-0.045
Willemite	1.690-1.723	0.028-0.033
Rhodizite	1.690	none
Triphylite	1.689-1.702	0.006-0.008
Lithiophilite	1.680-1.700	0.01
Dumortierite	1.678-1.689	0.015-0.037
Legrandite	1.675-1.740	0.060
Hypersthene	1.673-1.731	0.010-0.016
Parisite	1.671-1.772	0.081-0.101
Clinozoisite	1.670-1.734	0.010
Sinhalite	1.665-1.712	0.036-0.042
Lawsonite	1.665-1.686	0.019-0.021
Diopside	1.664-1.730	0.024-0.031
Bustamite	1.662-1.707	0.014-0.015
Kornerupine	1.660-1.699	0.012-0.017
Hiddenite	1.660-1.681	0.014-0.016
Kunzite	1.660-1.681	0.014-0.016
Boracite	1.658-1.673	0.010-0.011
Axinite	1.656-1.704	0.010-0.012
Malachite	1.655-1.909	0.254
Sillimanite	1.655-1.684	0.014-0.021
Jadeite	1.652-1.688	0.20
Peridot	1.650-1.703	0.036-0.038
Ludlamite	1.650-1.697	0.038-0.044
Enstatite	1.650-1.680	0.009-0.012
Euclase	1.650-1.677	0.019-0.025
Phenakite	1.650-1.670	0.016
Diopase	1.644-1.709	0.051-0.053
Jet	1.640-1.680	none
Eosphorite	1.638-1.671	0.028-0.035
Spurrite	1.637-1.681	0.039-0.040
Jeremejevite	1.637-1.653	0.007-0.013
Barite	1.636-1.648	0.012
Siderite	1.633-1.875	0.242
Danburite	1.630-1.636	0.006-0.008
Clinohumite	1.629-1.674	0.028-0.041
Apatite	1.628-1.649	0.002-0.006
Andalusite	1.627-1.649	0.007-0.013
Friedelite	1.625-1.664	0.030
Smithsonite	1.621-1.849	0.228
Datolite	1.621-1.675	0.040-0.050
Celestite	1.619-1.635	0.010-0.012
Tourmaline	1.614-1.666	0.014-0.032
Actinolite	1.614-1.653	0.020-0.025
Hemimorphite	1.614-1.636	0.022
Lazulite	1.612-1.646	0.031-0.036
Prehnite	1.611-1.669	0.021-0.039
Gaspéite	1.610-1.810	0.22
Turquoise	1.610-1.650	0.040
Topaz	1.609-1.643	0.008-0.016
Sugilite	1.607-1.611	0.001-0.004
Sogdianite	1.606-1.608	0.002
Brazilianite	1.602-1.623	0.019-0.021
Rhodochrosite	1.600-1.820	0.208-0.220
Odontolite	1.600-1.640	0.010
Nephrite	1.600-1.627	0.027
Pectolite (larimar)	1.595-1.645	0.038
Montebrasite	1.594-1.633	0.22
Phosphophyllite	1.594-1.621	0.021-0.033
Meliphanite	1.593-1.612	0.019
Eudialyte	1.591-1.633	0.003-0.010
Chondrodite	1.592-1.646	0.028-0.034
Catapleite	1.590-1.629	0.039
Wardite	1.590-1.599	0.009
Herderite	1.587-1.627	0.023-0.032
Colemanite	1.586-1.615	0.028-0.030
Howlite	1.586-1.605	0.019
Zektzerite	1.582-1.585	0.003
Amblygonite	1.578-1.646	0.024-0.030
Ekanite	1.572-1.573	0.001
Anhydrite	1.570-1.614	0.044
Augelite	1.570-1.590	0.014-0.020
Emerald (beryl)	1.565-1.602	0.006
Aquamarine (beryl)	1.564-1.596	0.004-0.005
Variscite	1.563-1.594	0.031
Beryl (precious)	1.562-1.602	0.004-0.010
Tremolite	1.560-1.643	0.017-0.027
Vivianite	1.560-1.640	0.050-0.075
Serpentine	1.560-1.571	0.008-0.014
Larbradorite	1.559-1.570	0.008-0.010
Hambergite	1.553-1.628	0.072
Pyrophyllite	1.552-1.600	0.048
Muscovite	1.552-1.618	0.036-0.043
Beryllonite	1.552-1.561	0.009
Charoite	1.550-1.561	0.004-0.009
Amethyst (quartz)	1.544-1.553	0.009
Aventurine (quartz)	1.544-1.553	0.009
Rose quartz	1.544-1.553	0.009
Citrine (quartz)	1.544-1.553	0.009
Prasiolite (quartz)	1.544-1.553	0.009
Smoky quartz	1.544-1.553	0.009
Rock crystal (quartz)	1.544-1.553	0.009
Andesine	1.543-1.551	0.008
Orthoclase	1.542-1.549	0.007
Talc	1.540-1.590	0.050
Scapolite	1.540-1.579	0.006-0.037
Petrified Wood	1.540	none
Jasper	1.540	none
Amber	1.539-1.545	none
Ivory	1.535-1.570	none
Apophyllite	1.535-1.537	0.002
Tiger's eye	1.534-1.540	none
Aragonite	1.530-1.685	0.155
Agate	1.530-1.540	0.004-0.009
Chalcedony	1.530-1.540	0.004-0.009
Chrysoprase	1.530-1.540	0.004-0.009
Moss agate	1.530-1.540	0.004-0.009
Sepiolite	1.530	none
Witherite	1.529-1.677	0.148
Miarite	1.529-1.551	0.003
Nepheline	1.526-1.546	0.0004
Sunstone	1.525-1.548	0.01
Cordierite	1.522-1.578	0.008-0.018
Iolite (cordierite)	1.522-1.578	0.008-0.018
Amazonite	1.522-1.530	0.008
Pearl	1.520-1.690	0.156
Ammolite	1.520-1.680	0.155
Strontianite	1.520-1.670	0.150
Gypsum	1.520-1.529	0.009
Orthoclase	1.518-1.530	0.008
Sanidine	1.518-1.530	0.008
Moonstone	1.518-1.526	0.008
Pollucite	1.517-1.525	none
Carletonite	1.517-1.521	0.004
Stichtite	1.516-1.544	0.026
Thomsonite	1.515-1.542	0.006-0.025
Magnesite	1.509-1.717	0.022
Scolecite	1.509-1.525	0.007-0.012
Leucite	1.504-1.509	0.001
Mesolite	1.504-1.508	0.001
Dolomite	1.502-1.698	0.185
Petalite	1.502-1.519	0.012-0.017
Lapis lazuli	1.500	none
Haüyne	1.496-1.510	none
Tugtupite	1.496-1.502	0.006
Cancrinite	1.495-1.528	0.024-0.029
Celluloid	1.495-1.520	none
Ulexite	1.491-1.520	0.029
Yugawaralite	1.490-1.509	0.011-0.014
Whewellite	1.489-1.651	0.159-0.163
Kurnakovite	1.488-1.525	0.036
Inderite	1.486-1.507	0.017-0.020
Calcite	1.486-1.658	0.172
Coral	1.486-1.658	0.160-0.172
Moldavite	1.48-1.540	none
Natrolite	1.480-1.493	0.013
Sodalite	1.480	none
Analcime	1.479-1.489	none
Thumasite	1.464-1.507	0.036
Creedite	1.461-1.485	0.024
Chrysocolla	1.460-1.570	0.023-0.040
Obsidian	1.450-1.550	none
Gaylussite	1.443-1.523	0.080
Glass	1.440-1.900	none
Fluorite	1.434	none
Sellaite	1.378-1.390	0.012
Opal	1.370-1.520	none

Source: International Gem Society (IGS)

Notes

A double refraction of "none" means the stone is either **isometric** or **amorphous**. "Anomalous" means this singly refractive stone may show **anomalous double refraction** (ADR). Singly refractive gems with high refractive indices may show ADR.