

Properties of Natural and Simulated Diamonds

Gem	Source	Composition	Common dates of use	Mohs' hardness	Refractive index	Specific gravity	Dispersion	Crystal indices	Fluorescence	Optical	Other
Corundum	natural or synthetic	Al ₂ O ₃	1900-1947	9	epsilon = 1.757-1.768; omega = 1.765-1.776	3.96-4.05	0.018	hexagonal crystal system with tabular, prismatic or pyramidal crystals; fracture = conchoidal	orange to red; heat treated stones may fluoresce green	marked dichroism	natural inclusions minerals and fluid are common; synthetic may have gas bubbles and curved striae; low thermal conductivity
Cubic zirconia	synthetic	ZrSiO ₄	1976 - present	8.5	2.15-2.18	5.6-6.0	0.06	fracture = conchoidal	yellow fluorescence in shortwave UV		usually no inclusions; low thermal conductivity
Diamond	natural	C	1476 - present	10	2.4175	3.51-3.53	0.044	cubic crystal system; perfect cleavage in four directions.	may fluoresce pale colors in longwave UV; may phosphoresce		Numerous inclusions; trigonal on surface; very high thermal conductivity
Garnet	synthetic	YAG/GGG	1970-1976	8.25/7.0	1.87/1.97	4.6/7.0	0.028/0.045	cubic crystal system		isotropic	turns brown in UV light; low thermal conductivity
Moissanite	synthetic	silicon carbide	1998 - present	8.5-8.25	2.65-2.69	3.22	0.104		may have pale fluorescence	strongly birefringent; anisotropic	may have brown tint; resistant to heat; inclusions occur as fine white tubes; high thermal conductivity
Paste diamond	synthetic	high lead glass	1700 - present	5.0-6.0	1.67	2.4-4.2	>0.02			highly refractive	low thermal conductivity; used since 1700
Quartz	natural	SiO ₂		7	epsilon = 1.553; omega = 1.544	2.65-2.66		trigonal crystal system; low birefringence; fracture = conchoidal		low birefringence	heat treatments may bleach stones; low thermal conductivity; low thermal expansion;
Rutile	synthetic	TiO ₂	1947-1955	6	2.6-2.9	4.25	0.33			doubly refractive	may have yellow tint; low thermal conductivity
Spinel	natural or synthetic	MgAl ₂ O ₄	1920-1947	8	1.715-1.725	3.5-4.1	0.02	isometric crystal system; fracture = conchoidal	natural fluoresces red in longwave; synthetic may fluoresce in shortwave	anisotropic	Natural stone has octahedral inclusions; may have fingerprint patterns; low thermal conductivity
Strontium titanate	synthetic	SrTiO ₃	1955-1970	5.5	2.41	5.13	0.19				low thermal conductivity
Tourmaline	natural	aluminum borosilicate		7-7.5	epsilon = 1.610-1.650; omega = 1.635-1.675	2.9-3.2		hexagonal, prismatic crystals; fracture = conchoidal	little fluorescence	pleochroic; high birefringence	inclusions include gas or liquid pockets and color zoning; develops electrical charge when heated
Zircon	natural	ZrSiO ₄		6.0 - 7.5	epsilon = 1.968-2.015; omega = 1.923-1.960	4.6-4.7	0.039	tetragonal system with square prismatic crystals; brittle; fracture = uneven	some show dull yellow color; some may phosphoresce	pleochroic; high birefringence	heating brown zircon crystals produces strong colors (blue, green, red, etc.) that fade slowly with time or with UV exposure; low thermal conductivity