

## Characteristics of Common White Pigments

Pigment	Composition	CI numbers	Usage	Density	Refractive Index	Microscopic characteristics	Other characteristics	Health
Aluminum trihydrate	Al(OH) <sub>3</sub>	Pigment White 24; CI 7702		2.42-2.45	1.568 - 1.587	fine grains; colorless in plane-polarized light; no birefringence	fluoresces purple	No significant hazards
Antimony trioxide	Sb <sub>2</sub> O <sub>3</sub>	Pigment White 11	introduced in 1920	5.67-5.75	2.18; 2.35	fine crystals (about 1 micron) appearing rounded or cubic; colorless in plane-polarized light; isotropic with low birefringence	soluble in concentrated acids and strong alkalis	toxic by inhalation and ingestion; skin contact is corrosive
Barite	barium sulfate, BaSO <sub>4</sub>	Natural: Pigment White 22; Synthetic: Pigment White 21, CI 77120	most common from 18th century to present	4.3-4.6	1.636; 1.637; 1.648	difficult to see in Meltmount; low birefringence; under cross polars, rotating the stage may cause the particles to twinkle	often used as an extender in conjunction with other white pigments	no significant hazards
Chalk (whiting)	calcium carbonate, CaCO <sub>3</sub>	Pigment White 18; CI 77220	since antiquity	2.7-2.95	1.486 (1.510); 1.645	small irregular shaped particles (0.1-10 microns); high birefringence with strong interference colors	may fluoresce a medium purple color; reacts with acids to evolve carbon dioxide.	no significant hazards
Gypsum	calcium sulfate dihydrate, CaSO <sub>4</sub> · 2H <sub>2</sub> O	Pigment White 25	since antiquity	2.32-2.36	1.520; 1.523; 1.530	low birefringence; euhedral shaped crystals with inclusions	fluoresces purple	no significant hazards
Kaolin	Al <sub>2</sub> Si <sub>2</sub> O <sub>5</sub> (OH) <sub>4</sub>	Pigment White 19; CI 77005	since antiquity	2.16-2.63	1.558; 1.565; 1.564	translucent and colorless with moderate relief; under crossed polars, particles have low birefringence	fluoresces pale white	no significant hazards
Lead sulfate	PbSO <sub>4</sub>	Pigment White 3	occurs naturally as the mineral anglesite	6.12-6.39	1.878; 1.883; 1.895	transparent colorless particles with high relief; moderate birefringence	fluoresces a weak yellow to white	toxic, carcinogen, teratogen, suspected mutagen
Lead white	basic lead carbonate (hydrocerussite) 2PbCO <sub>3</sub> ·Pb(OH) <sub>2</sub>	Pigment White 1	ancient times to mid 19th century; use in interior house paints prohibited in 1978 in U.S.	6.70-6.86	e=1.94; w=2.09	fine, fairly uniform, rounded tabular particles (0.5 - 10 microns); high birefringence under cross polars with 3rd or 4th order interference colors; complete extinction for single particles	dissolves in acids giving off CO <sub>2</sub> ; fluoresces reddish purple; darkens with exposure to alkalis and sulfur	toxic, carcinogen, teratogen, suspected mutagen
Lithopone	ZnS (30%); BaSO <sub>4</sub> (70%)	Pigment White 5	first produced 1874; used through first half of 20th century	4.3	2.3 (ZnS), 1.64 (BaSO <sub>4</sub> )	very fine particles (0.3-0.5 microns)	dissolves in HCl releasing sulfur fumes; can darken in the presence of iron	no significant hazards
Magnesite	magnesium carbonate, MgCO <sub>3</sub>	Pigment White 18	used in ancient plasters, occasionally ground as pigment	3.0	1.508; 1.510; 1.700	translucent, colorless, angular crystals; high birefringence under crossed polars; extinction is complete and straight	soluble in acids	nontoxic; ingestion has a laxative effect
Silica / Quartz	silicon dioxide, SiO <sub>2</sub>	Pigment White 27	found in ochers and as filler	2.2-2.65	1.40-1.55	conchoidal fracture; slightly birefringent. Ground glass is isotropic.	dissolves in hydrofluoric acid	no significant hazards
Talc	hydrated magnesium silicate, Mg <sub>3</sub> Si <sub>4</sub> O <sub>10</sub> (OH) <sub>2</sub>	Pigment White 26	occurs worldwide	2.5-2.8	1.539; 1.589; 1.589	ground particles can be very small (2.0 microns); high birefringence	insoluble in water, acids or alkalis	no significant hazards
Titanium dioxide (anatase)	TiO <sub>2</sub>		synthetic used from 1928 till early 1940s	3.9	2.54-2.55	very small round particles (0.2-0.3 microns); high birefringence under crossed polars.	weak white fluorescence	no significant hazards
Titanium dioxide (rutile)	TiO <sub>2</sub>	Pigment White 6; CI 77891	mineral described in 1803; synthetic used as pigment from 1941	3.75-4.3	2.71 - 2.72	small round or prism particles (0.2-0.5 microns); high birefringence and interference colors	fluoresces gray or dark purple	no significant hazards
Witherite	barium carbonate, BaCO <sub>3</sub>	Pigment White 10; CI 77099	primarily 19th c.	4.3	1.529; 1.676; 1.677	Flat tablets that are colorless under plane-polarized light; high birefringence with complete extinction; interference colors are often seen	fluoresces a light blue color in both long and short wave UV	toxic by ingestion; skin contact may cause irritation
Zinc white	zinc oxide, ZnO	Pigment White 4; CI 77947	first produced in 1781, though not popular until 20th century	5.47-5.65	2.00; 2.02	very fine crystalline grains with low birefringence is low and first order interference colors	fluoresces yellow in longwave UV	inhalation or ingestion of dust may cause slight irritation

