

Pigment Timeline for the Primary Elements Associated with Colorants

Brian Baade and Kristin deGhetaldi

Pigment	Primary Element(s)	Dates of Use
White		
Chalk	(Ca, S)	Ancient
Gypsum	(Ca, S)	Ancient
White lead	(Pb)	Ancient
Barium sulfate, artificial	(Ba, S)	1782
Zinc white	(Zn)	1780s
Lithopone	(Zn, Ba, S)	1850
Titanium white	(Ti)	1916
Black		
Bone black	(Ca, P)	Ancient
Ivory black	(Ca, P)	Ancient
Mars black	(Fe)	Mid-1800s
Brown		
Brown ochre	(Fe & pos. Al, Si, Ca)	Ancient
Umber	(Fe & pos. Al, Si, Ca)	Ancient
Sienna	(Fe & pos. Al, Si, Ca)	Ancient
Van Dyke brown	(Organic, Fe, Al, etc. pos.)	1500s
Mars colors	(Fe)	Mid-1800s
Blue		
Lapis lazuli ultramarine	(Al, S, Si, Na, & pos. Ca)	Ancient
Egyptian blue	(Cu, Si)	Ancient
Azurite	(Cu)	Ancient
Vivianite	(Fe, P)	Medieval
Synthetic copper blues	(Cu)	Medieval
Smalt	(Co, Si, & K)	1400–1500s
Blue verditer	(Cu)	1500s
Indigo	(Organic)	1600s in the West
Prussian blue	(Fe)	1704
Cobalt blue	(Co, Al)	1802
Synthetic ultramarine	(Na, S, Si, Al)	1827–1830
Cerulean blue	(Co, Sn)	1860
Manganese blue	(Mn, Ba)	1935
Phthalocyanine blue	(Cu, Cl)	1935
Cobalt turquoise light and dark	(Co, pos. Li, Ti, Zn, Cr)	1973
Green		
Green earth	(Fe, Si, Al, K & Mg)	Ancient
Malachite	(Cu)	Ancient
Verdigris	(Cu)	Ancient
Synthetic copper greens	(Cu)	Medieval
Scheele's green	(Cu, As)	1775
Emerald green	(Cu, As)	1814–1822
Cobalt green, Rinman's green PG19	(Co, Zn) 1780	(introduced in 1830s)
Ultramarine green	(Na, S, Si, Al)	after 1827
Chromium oxide green	(Cr)	1840s
Viridian	(Cr)	1840s
Cobalt Green-Blue oxide PG 26	(Co, Cr, Al)	Late 1800s
Phthalocyanine green	(Cu, Cl)	1938
Cobalt green PG 50	(Co, Ni, Ti)	1960
Yellow		
Yellow ochre	(Fe & pos. Al)	Ancient
Raw sienna	(Fe & pos. Al)	Ancient
Orpiment	(As, S)	Ancient
Yellow lead	(Pb)	Ancient

Pigment Timeline for the Primary Elements Associated with Colorants

Brian Baade and Kristin deGhetaldi

Pigment	Primary Element(s)	Dates of Use
Naples yellow	(Pb, Sb, & pos. Zn in 19th c.)	Ancient, 1500s-still avail.
Lead tin yellow	(Pb, Sn)	1300-1750
Patent yellow, Turner's yellow	(Pb, Cl)	1781
Strontium chromate yellow	(Sr, Cr)	1807
Barium chromate yellow	(Ba, Cr)	1807
Indian yellow	(Mg)	1800s-1908
Chrome yellow	(Pb, Cr)	1809
Cadmium yellow	(Cd, S, & possible Zn & Ba)	1846
Zinc yellow	(Zn, Cr)	1847-1850
Mars yellow	(Fe)	Mid-1800s
Cobalt yellow or aureolin	(Co)	1861
Nickel titanium yellow	(Ni, Ti, Sb)	1960s
Red		
Red ochre	(Fe & pos. Al, Si)	Ancient
Burnt sienna	(Fe & pos. Al, Si)	Ancient
Burnt umber	(Fe & pos. Al, Si)	Ancient
Realgar	(As, S)	Ancient
Cinnabar	(Hg, S)	Ancient
Red lead	(Pb)	Ancient
Vermilion	(Hg, S)	Medieval
Red lakes based on plants and bugs	(possible Al &/or Ca &/or Sn)	Medieval
Cochineal lakes	(possible Al &/or Ca &/or Sn)	1500s
Chrome red	(Pb, Cr)	1809
Pure scarlet, iodine scarlet	(Hg, I)	1814
Mars red	(Fe)	Mid-1800s
Ultramarine red	(Na, S, Si, Al)	after 1827
Alizarin crimson, synth. madder	(Al)	1868
Cadmium red	(Cd, Se, S, & possible Ba)	1910
Violet		
Murex or imperial purple	(organic)	Ancient
Red lakes based on plants and bugs	(possible Al &/or Ca &/or Sn)	Medieval
Cochineal lakes	(possible Al &/or Ca &/or Sn)	1500s
Ultramarine violet	(Na, S, Si, Al)	after 1827
Mars violet	(Fe)	Mid-1800s
Cobalt violet	(Co, early versions had As)	1859
Manganese violet	(Mn)	1868
Alizarin violet	(Al)	1868
Dioxazine violet	(organic)	1929

Brian Baade and Kristin deGhetaldi

Submitted 2012

REFERENCES

Bernstein, J. 2005. Mastering inpainting: A workshop for conservators and graduate students. Winterthur, DE: Winterthur/University of Delaware Program in Art Conservation.

Berrie, B. H. 1997. Prussian blue in *Artists' pigments: A handbook of their history and characteristics*, Vol. 3, 191-217. Washington, DC: National Gallery of Art.

Pigment Timeline for the Primary Elements Associated with Colorants

Brian Baade and Kristin deGhetaldi

Berrie, B., ed. 2007. *Artists' pigments: A handbook of their history and characteristics, Vol. 4*. Washington, DC: National Gallery of Art.

Church, A. H. 1901. *The chemistry of paints and painting*, 3d ed. London: Seely, Service and Co.
Doerner, M. 1934. *The materials of the artist and their use in painting*, trans. New York: Harcourt, Brace and Co.

Eastaugh, N., V. Walsh, T. Caplin, and R. Siddall. 2004a. *Pigment compendium: A dictionary of historical pigments*. Oxford, GB: Elsevier Butterworth-Heinemann.

— — — , 2004b. *Pigment compendium: Optical microscopy of historical pigments*. Oxford, GB: Elsevier Butterworth-Heinemann.

Feller, R. L., ed. 1986. *Artists' pigments: A handbook of their history and characteristics, Vol. 1*. Washington, DC: National Gallery of Art.

Feller, R. L. 1966. The problems of retouching: Chalking of intermediate layers. *Bulletin of the American Group IIC*