

Meet the Future: Rare, Exotic Elements for Modern Artists' Pigments

Matthijs de Keijzer

Cultural Heritage Agency of the Netherlands, Amsterdam, Netherlands

Famous historic pigments contain the elements Pb, Cu, Hg, As, Mn, Sn, Zn, Co, Cd, Cr and Ti. Based on the elements Nb, Y and In and new chemical structures pigments of this century have been constructed: rutile tin zinc oxides, niobium tin pyrochlore and YInMn blue. Due to excellent properties some of them have entered the artist's palette.

Rutile tin zinc oxide, $(\text{Sn,Zn})\text{Ti}_x\text{O}_y$, is a mixed crystal compound of oxides of titanium, tin and zinc. PY 216 was patented in 1984 and 20 years later Rockwood Pigments introduced three yellows under the name Solaplex. In 2006-2010 improvements came in the product class and modifications enabled an orange shade (PO 82). PY 216 is introduced in oil - and watercolours as an alternative for the chrome yellows (PY 34).

Niobium tin pyrochlore (PY 227), $\text{Sn}_2\text{Nb}_2\text{O}_7$, is the most recent innovation in the yellow field. It is a mixed crystal compound of oxides of niobium and tin. In the period 2005-2010 Johnson Matthey Public Limited Company and Loughborough University patented methods based on a modified pyrochlore structure. In 2010 Shepherd Color Company (SCC) came up with an alternative covered by patents in 2012. The pigments range from yellow to red depending on the Sn : Nb - ratio and are developed for plastics, coatings and paints.

YInMn blue (PB 86), $\text{YIn}_{1-x}\text{Mn}_x\text{O}_3$, is a mixed crystal compound of oxides of yttrium, indium and manganese. In 2009, chemists of the Oregon State University (OSU), tried to find new materials for electronics applications. By one series of tests a blue was obtained at a temperature of 1200 °C. OSU patented the invention in 2012 (U.S. patent 8.282.728) and reached a licensing agreement with SCC for its industrial manufacture. The crystal structure is known as trigonal bipyramidal coordination. By varying the In : Mn - ratio the colour can be tuned from sky blue to black. YInMn blue has an infrared reflectivity of about 40%. Therefore it is suitable for exterior applications, like outdoor paints to paint roofs to keep buildings and future cars cool. The blue pigment, produced as Blue 10G513 by SCC, is as an artist's pigment for a very high price available.