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CHSOS Application note # 6

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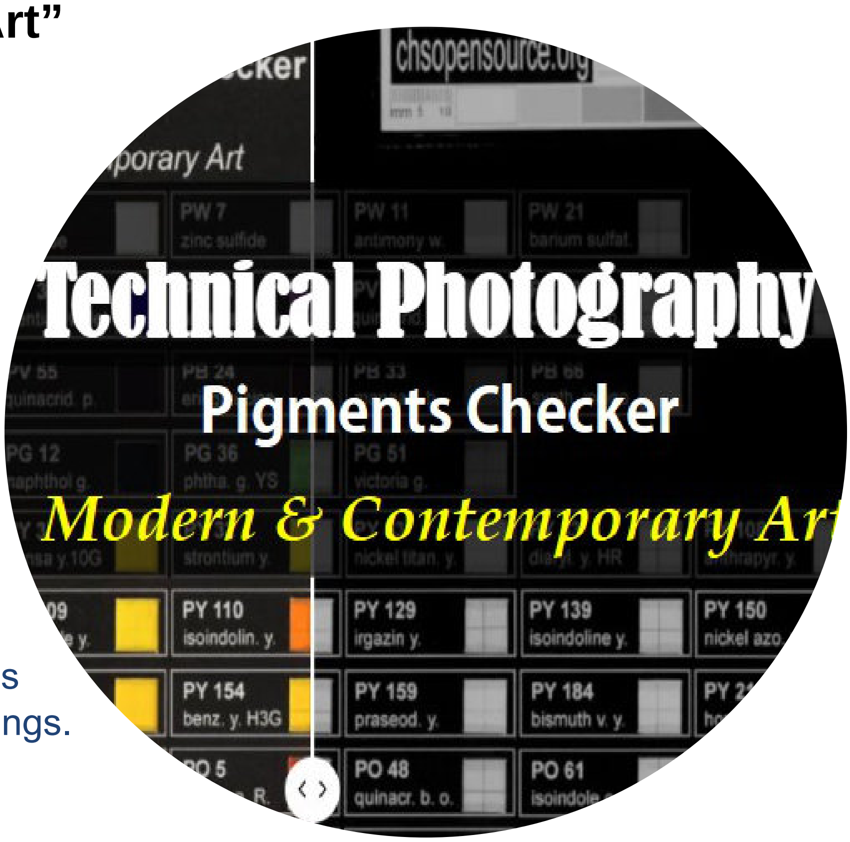
Technical Photography of Pigments Checker "Modern & Contemporary Art"



Just published on our website the **Technical Photography** documentation for the new Pigments Checker "Modern & Contemporary Art".

The images were acquired with our **CHSOS Technical Photography KIT** that covers the UV-VIS-IR spectral range. This note discusses the images and highlights the most important findings.

Technical Photography (TP) represents a collection of images realized with a modified digital camera sensitive to the spectral range about 360-1000 nm [1-4]. Different lighting sources and filters are used to acquire a selection of technical images, each one providing different information regarding the object under examination. The CHSOS Technical Photography KIT includes all you need to acquire these images.

Pigments Checker "Modern & Contemporary Art"

This is a collection of the most important pigments used in modern & contemporary art. On the other hand, the STANDARD Pigments Checker is a collection of the most used pigments from prehistory to contemporary art, and consequently, it has just few modern pigments. This new checker is focused solely on modern pigments and completes those already included in the standard Pigments Checker. The colors are laid with an acrylic binder on a cardboard support. We collected the spectra of the pigments and that of the binder alone on the cardboard. All these spectra are available online on the Pigments Checker webpage.

Figure 1. CHSOS Technical Photography KIT. Mandatory components: lamps, camera, filter set, and the calibration card. Optional components are the laptop with pre-installed software, and pigments checker.

The Technical Photography documentation

Figure [1] shows the mandatory equipment used for this documentation, CHSOS Technical Photography KIT. The essential components are the ELIO lamps, Alice lamps, Fabrizio lamps, Robertina filters set, TP-MSI card (included in Pigments Checker), and the modified camera for UV-VIS-IR.

Figure [2] shows all the 6 technical images taken for this analysis. The acronyms are: VIS (visible, standard photo), UVF (Ultraviolet Fluorescence), UVR (Ultraviolet Reflected), IR (Infrared), IRF-UV, and IRF-VIS (Infrared Fluorescence, respectively, made using the UV Lamp Fabrizio, or the VIS lamp ALICE).

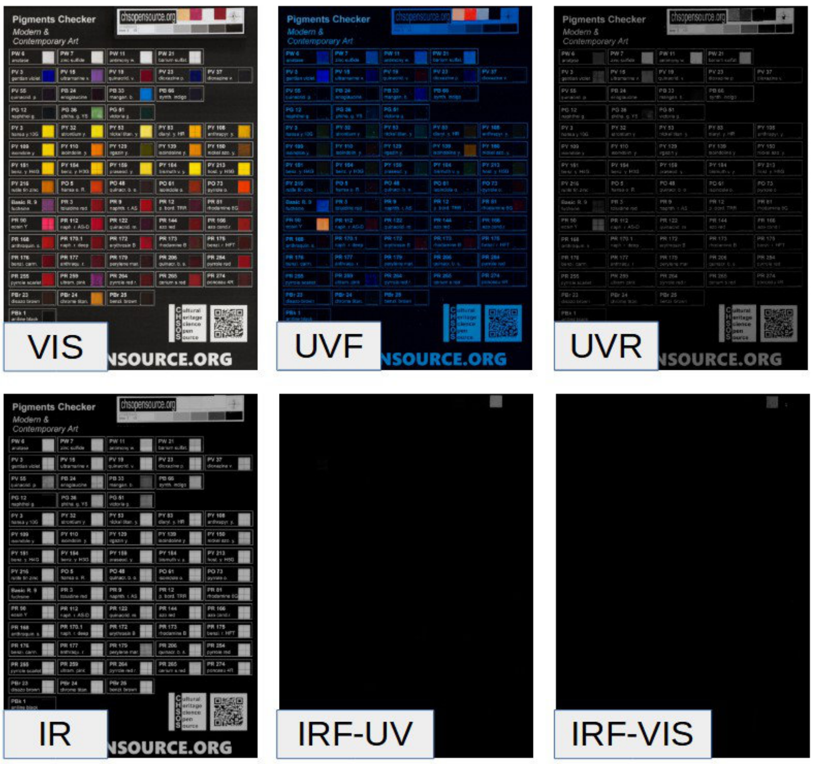


Figure 2. Technical Photography documentation of Pigment Checker "Modern & Contemporary Art".

UVF Photography

Most pigments did not reveal a characterizing fluorescence emission but they absorb most of the UV radiation. PR 90 eosin Y is the one, among these modern pigments, that features the strongest fluorescence emission, with a bright orange color, figure [3].

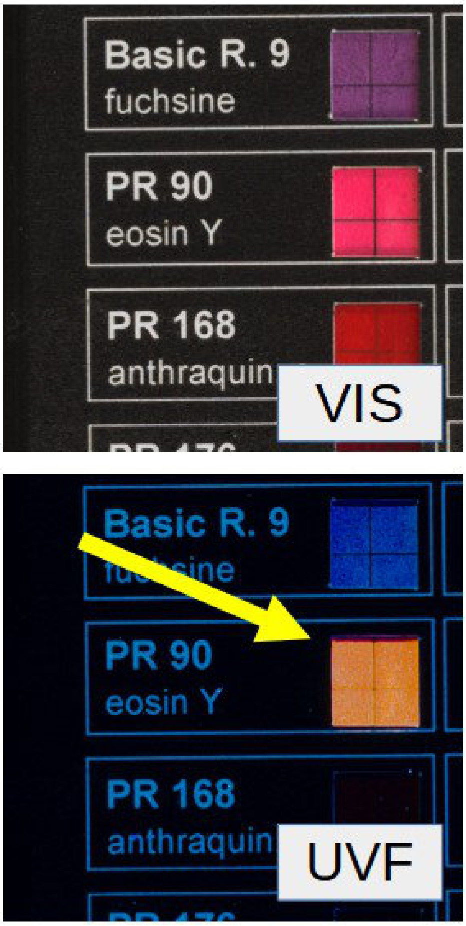


Figure 3. VIS and UVF, detail. PR 90 eosin Y turns from pink to a strong orange.

UVR photography

As for the standard Pigments Checker, the most interesting and useful UVR features are for the white pigments. We took a UVR photo of the 2 pigments checkers, standard and modern, assembled together in order to have the same UV irradiation and post-processing editing, figure [4].
Titanium white (rutile) and zinc white, in Pigments Checker standard, as well as anatase, absorb UV radiation. This feature is useful to spot their use on paintings as the most common white pigment before the 1920', lead white, reflects the UV and appears bright in UVR photos. Figure [5] shows the reflectance spectra acquired with the FORS GorgiasUV system on these white pigments [5]. Titanium white is the one that absorbs the most UV, then there is zinc white and the last is anatase. Lead white keeps reflecting the UV even up at 350 nm. These features are noticeable also in the UVR image.

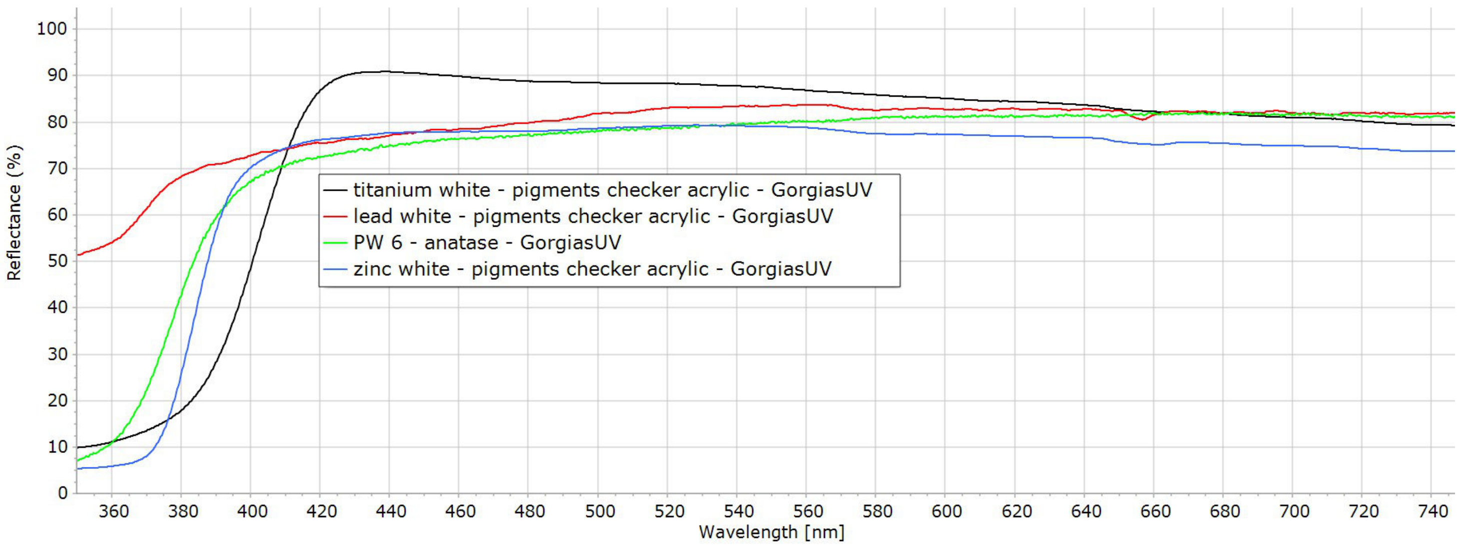


Figure 5. Reflectance Spectra (FORS) acquired with GorgiasUV of the most important historical and modern white pigments.

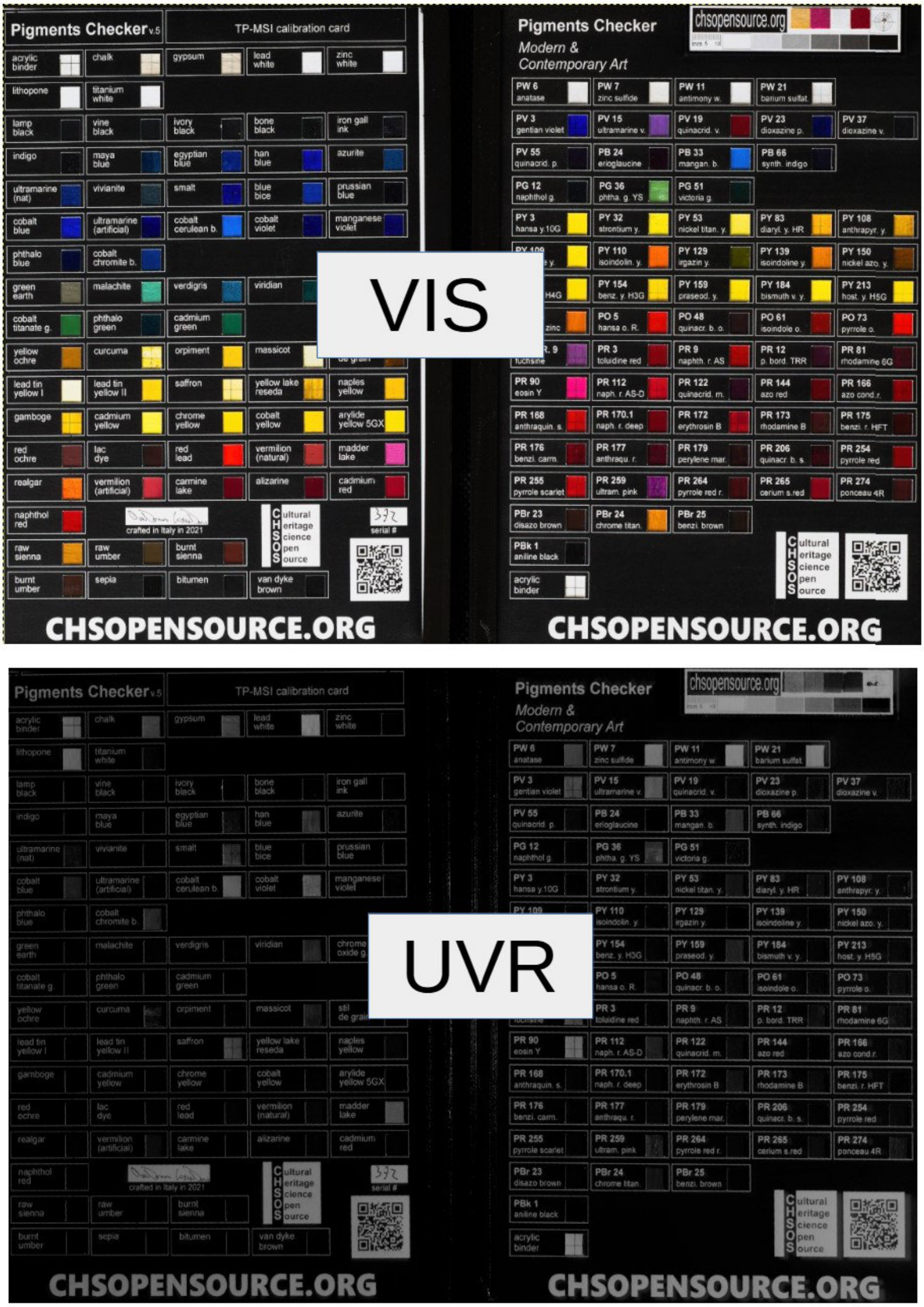


Figure 4. VIS and UVR of the 2 Pigments Checkers, “standard” and “modern”.

Figure [6] assembles together the white pigments UVR photos. It shows that lead white is the brightest, followed by anatase. Eventually, titanium white (rutile) and zinc white are the darkest. This information is useful to make a preliminary identification of the white pigments. In particular, it is relevant the different UV absorption exhibited by titanium white (rutile) and anatase.

Titanium white is a general name to indicate a white pigment that is made of one (or a mixture) of the two forms of titanium oxide: anatase and rutile. These crystals have the same chemical formula, TiO_2, but different relative positioning of the 3 atoms (they are 2 polymorphs of titanium oxide).

The standard Pigments Checker v.5 has the rutile titanium white. Nowadays titanium white is all made from rutile. But this was not always the case. From about 1920 titanium white was made mostly of anatase because it was more easy to produce. From about 1940 a cheap production method for rutile was established and it replaced anatase, since it was more lightfast and had a stronger hiding power.

The new “modern and contemporary art” pigments checker has the “anatase” titanium white.

Case study: Indian Mughal miniature

We did test the CHSOS Technical Photography KIT on a Indian Mughal miniature painting which was supposed to be from the 18th century, likely 1790, figure [7].
We were interested in evaluating the authenticity of the item and, in particular, its dating [6].

The XRF analysis revealed the white paint is made of titanium. As shown in figure [8], the UVR image of the white paint is bright indicating that this is not a modern rutile titanium white which turns black in the UVR photo, but rather the older version, anatase. This type of titanium white was also confirmed with the Raman Spectroscopy system ElviRA.

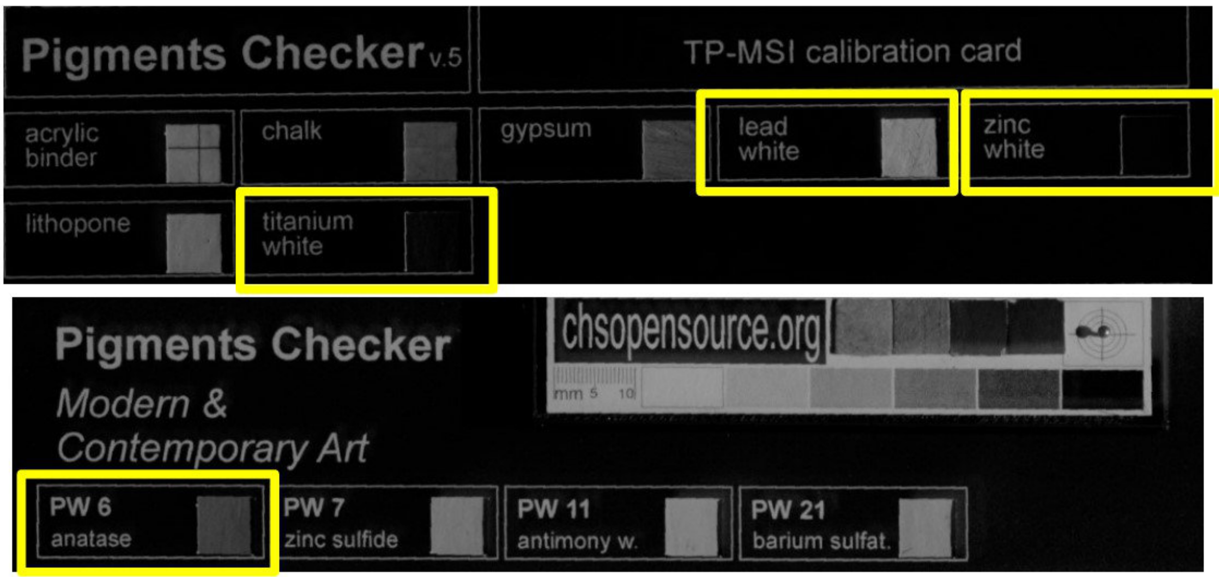


Figure 6. UVR photo. Details from the 2 Pigments Checkers.

Figure 7. Indian Mughal miniature painting tested with the 2 Pigments Checkers, standard and modern.

Figure 8. Indian Mughal miniature painting, detail. The white paint turns bright in the UVR photo suggesting anatase, instead of rutile, the modern titanium white.

We know that anatase was in use from roughly 1920’-1940’. For a manuscript supposedly made in the 18th century, we were expecting lead white pigment, definitely not anatase. Furthermore, the identification of anatase indicates that the object was created not much later that the 1940’, otherwise we should have found more of the rutile titanium white.

IR Photography

As expected most of these modern pigments are transparent in the infrared. There are just few interesting exceptions. PW 6 - anatase reflects infrared and remains opaque, such as rutile.
All the blues and violets are transparent but manganese blue that absorbs infrared. The other pigments, yellows, orange, reds, and browns, all become transparent.
The only black pigment in these collection, PBk1 - aniline black, absorbs infrared and it is totally opaque, such as the carbon-black pigments in the standard Pigments Checker.

IRF Photography

The test of the IRF method, both IRF-UV and IRF-VIS did not reveal any pigments showing infrared fluorescence.

Conclusions

The analysis of the new set of modern pigments revealed some useful features. In particular, the different behavior in the UVR photo of the titanium oxides and white pigments, anatase and rutile. Also important was the infrared photo of the modern and common PBk1 - aniline black which behaves as the historical carbon-blacks, absorbing all of the infrared and becoming totally opaque.

References

[1] A. Cosentino “Identification of pigments by multispectral imaging a flowchart method” Heritage Science, 2:8, 2014.

[2] A. Cosentino “Practical notes on ultraviolet technical photography for art examination” Conservar Património 21, 53-62, 2015.

[3] A. Cosentino "Infrared Technical Photography for Art Examination” e-Preservation Science, 13, 1-6, 2016.

[4] A. Cosentino “Application note 3 - Transmitted Infrared Photography with SALVO” 2021.

[5] A. Cosentino “Application note #5: Reflectance Spectra Database (GorgiasUV Spectrometer) for Pigments Checker - Modern & Contemporary Art” 2022.

[6] A. Cosentino “Application note 4: Gorgias Reflectance Spectra Database for Pigments Checker Modern & Contemporary Art” 2022.

Pigments Checker (TP-MSI calibration card included)

670,00€ – 730,00€

Select options

Alice – Infrared Fluorescence lamp

120,00€

Add to cart

Elio – Halogen lamp

140,00€

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Fabrizio – UV lamp

1.420,00€

Add to cart

Robertina – Technical Photography Filters Set

760,00€ – 1.290,00€

Select options

Used Nikon D800 modified for UV-VIS-IR

2.750,00€

Add to cart