The Jos-Pe process in the Jacob Merkelbach collection at the Rijksmuseum in Amsterdam

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ABSTRACT

The Rijksmuseum in Amsterdam holds a collection of 208 photographs from the Merkelbach Studio (1907-1961 in Amsterdam). At least 28 of them were made with the Jos-Pe technique, which was invented in Hamburg in 1924 and remained in use for 20 years. This dye imbibition process is part of the early history of commercial color photography. This research project began with the characterization and visual examination of Jos-Pe prints on paper and three-color printing matrices on glass that are part of the Rijksmuseum's Merkelbach collection. The Rijksmuseum Jos-Pe prints and plates, as well as (aged) mock-ups were analyzed with different techniques: specular light, UV fluorescence, microscopy, XRF and liquid chromatography UPLC. A cross section obtained from an unexposed Jos-Pe paper made it possible to determine the prints 'structure: a paper coated with a thin layer of barium sulfate, topped with a thin layer of gelatin. The analyzed glass plates revealed the use of dyes such as carmine, Induline Blue and Dianil Yellow 2R. Fading tests performed on mock-ups made of the red dye showed a Blue Wool Standard (BWS) lightfastness of 1-2. The fading tests of the other two dyes were not performed. The specialized literature points out the lightfastness of the blue dye as 4 and 2-3 BWS for the yellow dye.

KEYWORDS Jos-Pe, Jacob Merkelbach, Dye-imbibition, Rijksmuseum, Subtractive Color Photography, Three Color Photography

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1. Introduction

The Merkelbach collection held at the Rijksmuseum in Amsterdam offers an interesting corpus for studying the industry of photographic processes and its evolution; with 13 different photographic processes the collection presents a very good example of the commercial photography in use those days, between the 1920's and 1940's. The Jos-Pe prints in the collection are probably the most interesting objects in this group of photographs (Fig. 1). The general lack of technical data on the process and the materials creates challenges for the conservation of these photographs. The objective of the research carried out in 2018 and 2019 was to study the material components of the prints and to examine the sensitivity of the image-forming dyes to factors such as light and oxygen, in order to evaluate exposure levels for exhibitions and loans.

2. Jacob Merkelbach and the Studio Merkelbach

Jacob Merkelbach was born in Amsterdam in 1877. During the first years of his professional career, he worked in a business belonging to his father and his brother-in-law: M.H. Laddé & J.W. Merkelbach, a shop selling magic lanterns, film and photographic materials and also the first film studio in the Netherlands (Hegeman and Leijerzapf, 1985). For a short period, Merkelbach worked in the film industry until he opened his own studio, in 1913. It was located in a fashion house, on the fifth floor of the luxurious Hirsch & Cie in the Leidseplein building in Amsterdam. He worked mainly on commercial portraits, and his clients came from the high society of Amsterdam. Merkelbach also worked for the theatre and dance world, producing many of the promotional images of actors and dancers of the Dutch scene. His frequent collaboration with the commercial galleries where the studio was located could be seen in the showcases of the ground floor, where Merkelbach often showed fashion photographs.

The studio offered its clients numerous and diverse techniques, from bromide photographic papers to pigment processes such as carbon prints or Jos-Pe prints (which are the focus of this research). The negatives on glass were heavily manipulated by the retouchers of the studio, as in European studio photography at the time, which was a great inspiration for Jacob Merkelbach. It was one of the most important studios in Amsterdam in the period between the wars.

Jacob Merkelbach died in 1942 and his daughter Mies continued the business until the 1960's, when the studio was closed for good (Veen *et al.*, 2013). During the last years, Mies Merkelbach sold what was left of the collection (negatives and prints) to different buyers and institutions. In that period, the Dutch collector Bert Hartkamp bought a group of 200 prints on paper, a group that later became part of the Rijksmuseum Collection. Other artworks produced by Studio Merkelbach can be found in the Special Collections at the University of Leiden, the Amsterdam City Archives (Stadsarchief), the Dutch Institute for Theater in Amsterdam (Theater Instituut Nederland) and the Jewish Historical Museum in Amsterdam (Joods Historisch Museum).

Fig. 1. Portret van een vrouw in een rode jurk, Jacob Merkelbach, 1920-1930. RP-F-F03962 Rijksmuseum.

3. The Jos-Pe process

Jos-Pe is the name of a photographic process registered by a company of the same name in Munich, Germany, in 1924, founded by the photographer and inventor Gustav Koppmann and Josef-Peter Walker (from whom the process takes its name). In 1926 the company moves to Hamburg. After bankrupt in 1931, a fellow customer, Franz Vollmer, takes over the company from 1934 until 1943, when a bomb destroyed the factory on the 25th of July (Koshofer, 2013; Thiele, 2006).

This technique is included in the group of the dye imbibition processes, together with other processes such as Sanger-Shepherd, Pinatype or Kodak Dye Transfer. It is a subtractive three-color process in which the print is made with three relief printing plates, blue, red and yellow, made from three color separation negatives (Pénichon, 2013). The process relies on the capacity of gelatin to absorb or release dyes when in contact with another layer of gelatin.

4. The special Jos-Pe camera

More than merely a photographic process, Jos-Pe was a complete printing system that offered the photographer all the necessary materials for printing in color. This included the special and advanced "Jos-Pe camera" which allowed the photographer to make the three-color separation negatives in one shot, avoiding the undesirable effect of time-parallax misalignments and allowing the photographer to take pictures of moving objects or portraits in color (Fig. 2). Until then, color separation negatives had been obtained in non-synchronized cameras or sledge-cameras such as the Dr. Miethe Three-color Camera, produced by Wilhelm Bermpohl since 1903, and also offered by the Jos-Pe company in its catalogue.


JOS-PE-VERTRIEB FÜR FARBENPHOTOGRAPHIE HAMBURG 1 SPALDINGSTR. 4–8

Die Jos-Pe Spezialkamera „Typ Uka".

Die Kamera ist für gleichzeitige Zeit- und Momentbelichtung von drei Teilnegativen in erster Linie als Portraitkamera für Berufsphotographen gebaut.

Plattengröße 9 × 12 cm für Papierbilder bis 50 × 60 cm.
Optik — Steinheil Spezialobjektive f : 3 bei 18 resp. 21 cm Brennweite mit eingebautem Compoundverschluß, einstellbar von 1—1/125 Sek.
Vorrichtung zum gleichzeitigen Scharfstellen der drei Bilder.
Gewicht kompl. ca. 9000 g. Ungefähre Maße: 21 × 23 × 35 cm.

Die Kamera wird komplett mit folgendem Zubehör geliefert:
1 Satz Lichtfilter (i. d. Kamera leicht auswechselbar eingebaut)
2 „ Doppelkassetten (6 Stück für 4 Aufnahmen)
1 Ausöser
1 Mattscheibenrahmen
1 Objektivdeckel

Preis: RM. 3000.—

JOS-PE-VERTRIEB FÜR FARBENPHOTOGRAPHIE HAMBURG 1 SPALDINGSTR. 4–8

Die Jos-Pe-Amateur-Kamera
4½ × 6

ist ein Instrument, das jedem Amateurphotographen, der die Grundzüge der Schwarz-Weiß-Photographie beherrscht, in die Hand gegeben werden kann.

Die Leistungsfähigkeit der Kamera ist außerordentlich. Schärfe der Zeichnung, hohe Lichtstärke der Optik, sorgfältige Abstufung der Filter, Empfindlichkeit des Aufnahmematerials verbürgen erstklassige Resultate bei selbst kurzen Momentaufnahmen von bewegten Objekten. Die Kamera ist verwendbar für alle Aufnahmezwecke eines Amateurs.

Plattengröße 4½ × 6 cm (liegend); für Papierbilder bis 24 × 30 cm. / Optik F:2,5 bei 10,5 cm Brennweite. / Eingebauter Compoundverschluß einstellbar 1—1/100 Sek. / Gewicht ca. 2870 gr. / Ungefähre Maße: 12 × 13 × 10½ cm.

Preis einschl. kompletter Ausrüstung . . . . . RM. 950.—

Die Kamera wird komplett mit folgendem Zubehör geliefert:
1 Satz Lichtfilter (5 Stück) in der Kamera leicht auswechselbar eingebaut. / 4 Satz Kassetten — 12 Stück gleich 8 Aufnahmen / 1 Ausöser / 1 Mattscheibenrahmen / 1 Objektivschutzdeckel / 1 Apparattasche aus Ia Rindleder.

1 Gummifilter	Preis RM.	7.80
1 Spezialsatz (Lichtf.)	" "	46.—
1 Segeltuchtasche hierzu	" "	5.—
1 Satz — 3 Stück Kassetten	" "	4.80

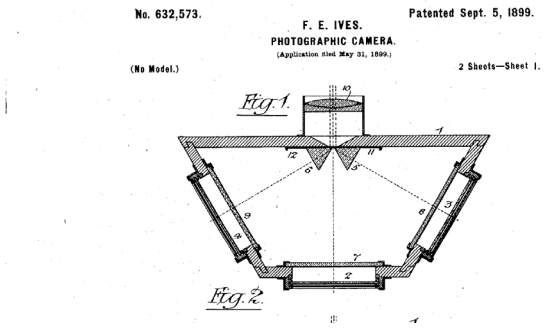
— Bei Nachbestellung von Kassetten bitten wir die gravierten Nummern anzugeben. —

Fig. 2. Jos-Pe catalogue. ca. 1930

The camera was constructed in a trapezoidal shape, with a lens in the front, built by Zeiss, and two mirrors manufactured by Steinheil Sohne located behind the lens (Jos-Pe Farbenfoto, 1930). This group of mirrors split the incoming beam of light into three individual beams, which exposed the three negatives located in the back of the camera through the corresponding color filters: red (in front of the lens), green and violet-blue, made with dyed gelatin sheets sealed between glass and located exactly before the glass negatives, next to the plate holders. Focusing was done with the aid of a ring in the front of the camera, set under the lens, and checked on the ground glass of the back, where later the plate holders were placed. In this manner, three black-and-white negatives on glass were obtained.

The Jos-pe catalogue offered two cameras for two types of consumers: amateur and professional (Uka Type). The differences lay in the size of the negatives: 4.5x6 cm or 9x12 cm, and certain features like the speed of the shutter and the quality of the materials used to construct the camera. The price difference between one and the other was substantial: 950 RM or 3000 RM (Reichsmark).

The Jos-Pe camera was probably one of the greatest contributions made by the Jos-Pe company to the color photography industry. It was inspired by the camera patented by Frederic Eugene Ives in 1899 (Ives, 1899) in which mirrors were used to split the beam of light inside the body of the camera (Fig. 3).


No. 632,573. Patented Sept. 5, 1899.

F. E. IVES.

PHOTOGRAPHIC CAMERA.

(Application filed May 31, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

Fig. 2.

Fig. 3. Photographic Camera. F.E.Ives. 1899. US Patent.

5. The three-color Jos-Pe printing technology

In the Jos-Pe process, the three relief printing plates on glass used to obtain the final prints on paper were obtained from three black-and-white negatives made with the Jos-Pe camera. The glass negatives (Fig. 4) were coated with a bromide silver gelatin emulsion. Due to the division of light inside of the camera, the quantity of light received by each negative varied: 25% of the light reached the blue and yellow plates and 50% exposed the red one (Jos-Pe Farbenfoto, 1930). The sensitivity of the Jos-Pe glass negatives and the thickness of the color filters was adjusted to this. Some authors suggested that other panchromatic glass plates could be used, although

the proprietary ones were specially fast (taking in account that the exposure was made through color filters that reduced the quantity of light reaching the negatives). Due to the high sensitivity of the emulsion, working under red light was not recommended. The development of the glass negatives must be done in complete darkness, unless a desensitizer was used in the process (Willekens, 1926).

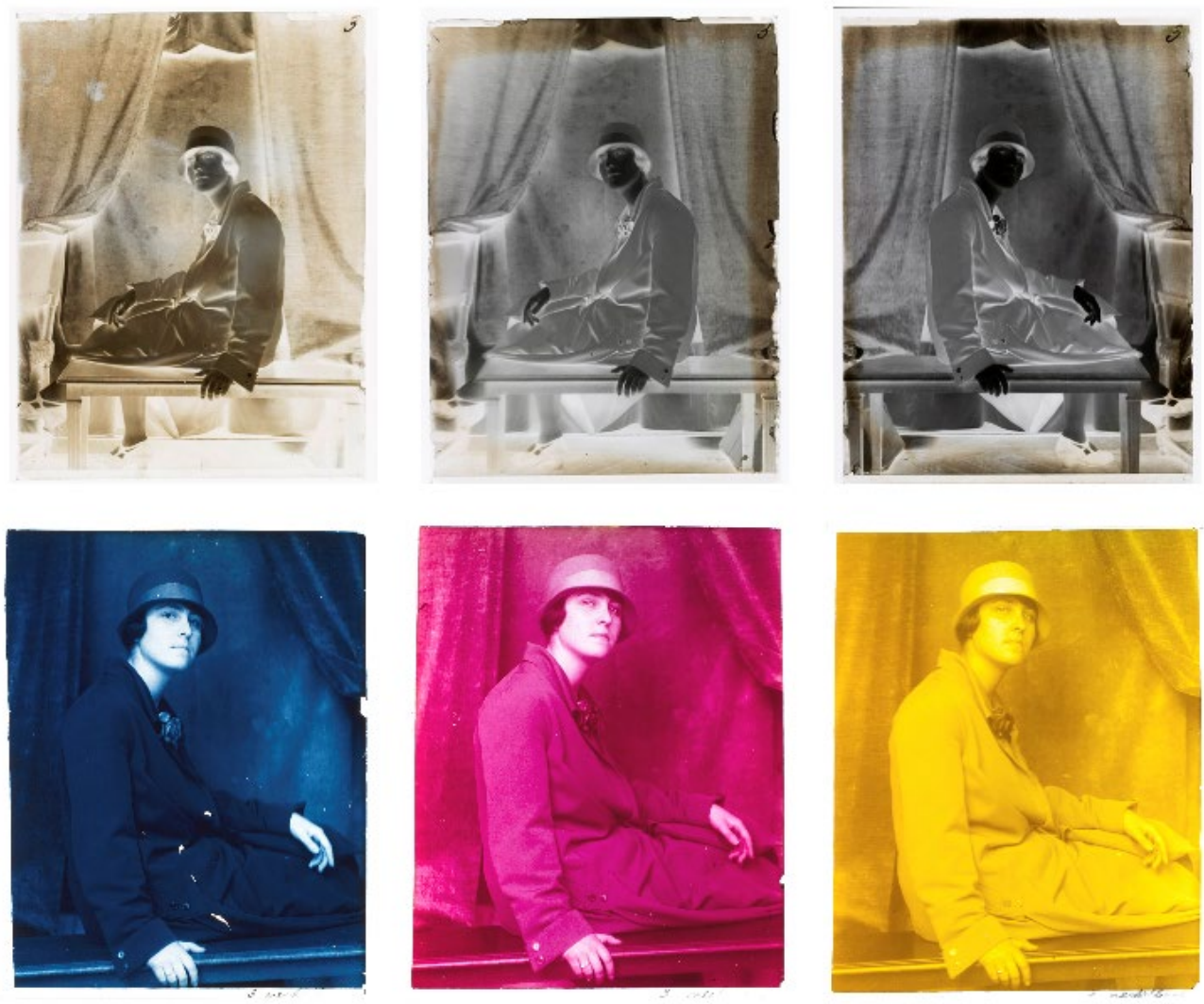


Fig. 4. Jos-Pe separation negatives and printing plates on glass. J. Merkelbach. RP-F-F26749-1/2/3 and RP-F-F26748-2/3/4. Rijksmuseum.

From the three negatives, the three printing plates (Fig. 4), or matrices, were enlarged to one of the common available formats (10x15 cm, 13x18 cm, 18x24 cm, 24x30 cm, 30x40 cm). The ensuing print would be made by contact. The matrices were manufactured on glass and also coated with a gelatin silver bromide emulsion.

The positive matrices were processed with a proprietary Jos-Pe tanning developer that probably included pyrocathecin with soda, caustic soda or ammonia (Willekens, 1926). The developer hardened the gelatin proportionally to the exposure to light and built up the necessary relief for printing. The unexposed areas (the non-hardened gelatin) would be removed under warm water (60 - 90º C). This method had already been described by Leon Warnerke in 1881, developed and applied by Gustav Koppmann in different patents, some of them under the name of the company Jos-Pe. The difference with non-relief processes was that there was no presence of gelatin in the white areas, which avoided dirty or blurry highlights.

To proceed with the printing process, each matrix was soaked in its corresponding Jos-Pe dye bath for 20 minutes for the first time and fewer minutes for the subsequent times. The dyes would be absorbed by the gelatin on the positive plate and remain in it until put in contact with a wet proprietary Jos-Pe paper. The dyes were sold in solid form but dissolved in water for this step. The manufacturer suggested using ammonia to dissolve the red dye in water. And citric acid was added to the blue and yellow dyes to facilitate the transfer of the dyes to the paper (Jos-Pe Farbenfoto, Patent No. DE000000421244A, 1924). The printing matrices could be used several times to produce multiple copies of the same image, until the relief looked deteriorated.

Fig. 5. Portret van Mies Rosenboom Merkelbach, Jacob Merkelbach, 1920-1930. RP-F-F26748-1. Rijksmuseum.

Here, the dyes transferred to the paper, in this manner forming the image there (Fig. 5). Users were recommended to start with the blue matrix and continue with either yellow or red. Thanks to the transparency of the printing plates, the superposition of the three images was easy if compared with other color printing processes with opaque matrices. However, this step was difficult and it is common to observe misregistrations in the final prints. According to Adrianus Antonius Marinus van Rietschoten, a retoucher at the Atelier Merkelbach, a Jos-Pe print would take a week to be finished (Veen *et al.*, 2013).

All the materials needed for the process were sold by the Jos-Pe company and distributed by licensed companies in different countries, for instance, Jos-Pe Trade Company Color Photo in Arnhem, for The Netherlands or Ibero Foto Color in Madrid, for Spain. Photographers interested in the process were kindly invited to attend workshops or events where the process was explained.

Most of the information collected on the process comes from the personal archive of the Catalan amateur photographer Mariano Ricart, interested in color printing processes, kept at the Institut de Estudis Fotogràfics de Catalunya, in Barcelona (Burgués and Belmonte, 2015) which includes numerous brochures, recipes, personal notes, study materials and correspondence between the photographer and the Jos-Pe Farbenfoto company. Another of the main sources for this research is the pamphlet published by Willekens in 1926 where the process is described at the same time as it is commented.

6. Characterization of the prints

Fortunately, the Rijksmuseum collection includes a complete set of the negatives, the printing plates and the final print of a photograph by Jacob Merkelbach (Fig. 4 and 5). This circumstance significantly aided our understanding of the process and gave us access to the original materials that could be analyzed for this research.

Under the microscope, Jos-Pe prints have a smooth continuous tone without any visible pattern. The dyes are shown in a soft tone, although sometimes individual particles are visible, perhaps due to their incomplete dissolution in water. Also small spots can be observed, probably produced during the printing process, when small bubbles in the gelatin were broken during the transfer of the image.

Another characteristic is the retouching process carried out by the photographer in order to improve the final image. Under specular light these corrections become visible, especially the ones created by scratching the surface of the print to make it lighter (Fig. 6). Retouching techniques also included adding media with a brush or with a pencil, to darken lighter areas or add details.

All of the prints in the Rijksmuseum collection have a matte surface, except one (RP-F-F03955) that shows a glossy coating on the surface. This coating did not fluoresce under UV irradiation, and no other analyses were carried

out during this research project, so it could not be identified at this time.

Fig. 6. Retouching on a Jos-Pe print observed with specular light. RP-F-F03967. Rijksmuseum.

If the print is not trimmed, the superposition of the three colors can be observed at the borders. The pressure marks made by the edges of the glass printing plates during the printing process are also visible (Fig. 7).

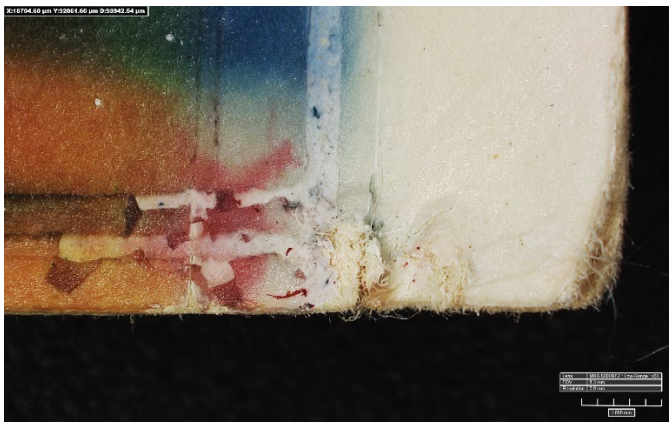


Fig. 7. Border of a Jos-pe print. Microscopy image (x35). RP-F-F04010. Rijksmuseum.

7. Instrumental analysis

To better identify the paper and media we used X-Ray Fluorescence analysis. The top layer of the support paper contains barium and sulfur, which indicates that the paper was coated with a baryta layer, used to isolate the fibers of the paper and create a white, uniform base for the image.

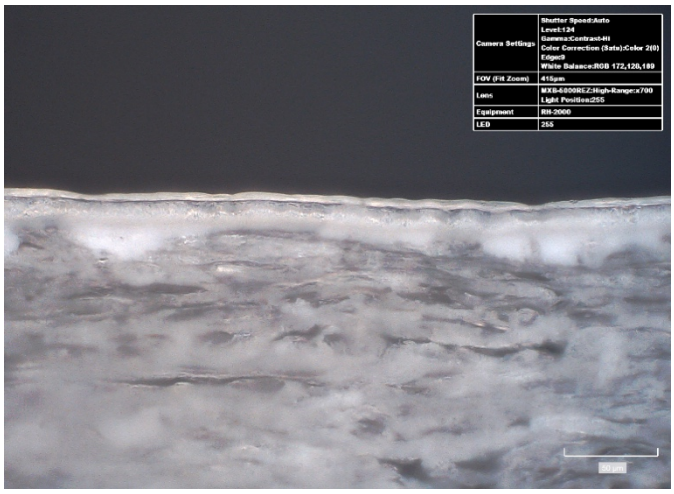


Fig. 8. Cross section of a Jos-Pe paper. Microscopy image (x700).

Thanks to the donation of a sample of Jos-Pe paper from Richart's archive from Institut de Estudis Fotogràfics de Catalunya (IEFC, Barcelona), we were able to perform a cross section. In this analysis we confirmed that the baryta layer had an extra top-coat of a thin gelatin layer, the image receiving layer (Fig. 8). This structure is observed under the microscope, specially at the borders (Fig. 9).

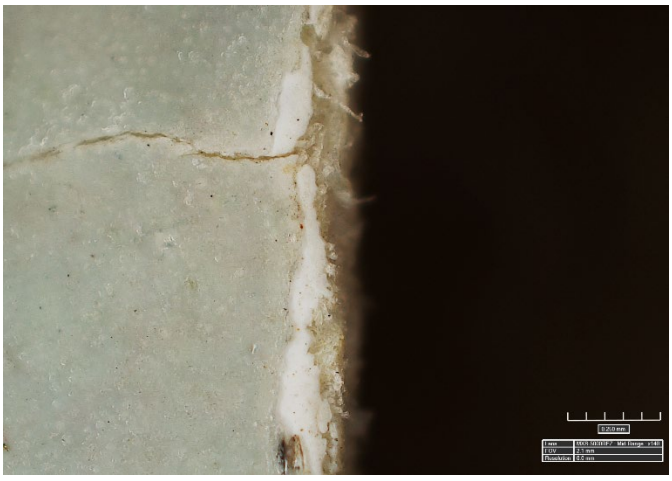


Fig. 9. Border of a Jos-pe print. Microscopy image (x35). RP-F-F03960. Rijksmuseum.

For the identification of the colorants we requested the expertise of Art Ness Proaño at the Rijksdienst voor het Cultureel Erfgoed (RCE). The dyes were sampled from the three printing plates, extracted from the gelatin and identified with liquid chromatography (UPLC). The red dye was identified as carmine (in ammonia), the blue dye was identified as Indulin B or Acid Blue 20 (sulphonated) and the yellow dye was identified as Dianil Yellow 2RI (Proaño and Neevel, 2020).

With this knowledge we proceeded to reconstruct the process in order to artificially light-fade mockups on paper to analyze the chemical stability of the dyes. The red sample was exposed for two, four and eight hours, and changes already became apparent in the first exposure period of two hours, indicating low lightfastness. The fading tests of the other two mockups have not been subjected to fading tests yet, however, the report from RCE suggests that, based on specialized literature, the lightfastness of the blue dye is BWS 4 and that of the yellow dye is 2-3.

8. Conclusion

This research shed light on this interesting process and its importance in the history of color photography. The Jos-Pe process, far from being a unique invention, benefitted from other inventions and patents. The basis of the printing system had already been described by Leon Warnerke, Leon Didier and Gustav Koppmann. The Jos-Pe camera was inspired by the Ives camera from 1899. The three Jos-Pe dyes are common in the literature of dye imbibition processes and were also used in the Pinatype. The Jos-Pe paper was a typical paper with a baryta layer and topcoat of gelatin. However, the Jos-Pe process made complex three-color photography available to a broader public, offering professional results to both amateurs and professional photographers. Our research indicates that the dyes are not very stable, although more research has to be performed in difference circumstances.

9. Conflict of interest declaration

The author states that no actual or potential conflicts of interest exist including financial, personal or other relationships with other people or organizations within three years of beginning the submitted work that could inappropriately influence, or be perceived to influence, her work.

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12. Short biography of the author

Laura Covarsí Zafrilla is an independent conservator specialized in photographic heritage. She received her M.A. in Conservation from Instituto Politécnico de Tomar, Portugal, with an internship in the photographic archive of the Maritime Museum of Barcelona (Spain). She previously studied History of Art (University of Salamanca, Spain) and Photography (School of Arts of Huesca, Spain). She worked for public and private collections in Spain and at the Rijksmuseum of Amsterdam between 2017 and 2019, where this research was carried out.

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