

The most valuable manuscripts of the Fryderyk Chopin Museum: an assessment of the collection's state of preservation and conservation problems in light of the paper's pH measurement results

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Summary: Diana Długosz-Jasińska. *The most valuable manuscripts of the Fryderyk Chopin Museum: an assessment of the collection's state of preservation and conservation problems in light of the paper's pH measurement results*

The article discusses the collection of musical manuscripts, letters, sketches, and drawings by Fryderyk Chopin, owned by the Fryderyk Chopin Museum in Warsaw. The collection is very diverse in many respects. The text will address technical and technological issues, such as the different types of paper and writing media used by the musician, with reference to the current state of preservation and to conservation treatments carried out over the years.

Regular inspections focus on the problem of ink corrosion; it is necessary to determine the extent of corrosion and, if required, plan local repairs. The pH levels of the original manuscripts and any added items were measured in 2023. During past restorations, paper defects were filled in, and free sheets were added (sometimes in large quantities) to provide an alkaline buffer and a safe environment to stabilise the pH level of the original documents. Many

items have their dedicated bookbinders made during the former conservation efforts. At that time, the results of the final pH measurements were carried in several binders, which has now made it possible to evaluate and compare the rate of change in the original manuscript despite the added conservation-quality materials. The results allow us to determine whether the added elements are still helpful or have become harmful and should be removed. The removal of acidified and unstable elements should be considered, and alternative preservation methods that do not permanently attach foreign materials should then be analysed.

Keywords: manuscripts, letters, drawings, Frederic Chopin, pH, acidic paper, ink corrosion, bookbindings.

Introduction

Since 2022, the Fryderyk Chopin Museum has been conducting systematic pH measurements of paper in historical items, covering both materials stored in the collection for many years and those acquired recently. These studies involve not only the original materials themselves, but also a variety of secondary paper elements that have been permanently attached to these items during past conservation procedures. These elements, often added to strengthen or protect the whole, can significantly affect the preservation of the paper, including its acidity level.

Controlling the degree of acidification of Chopin's heritage is an issue of particular importance, since an acidic environment accelerates the degradation of cellulose, leading to fiber weakening, loss of elasticity, and crumbling of the material¹. Monitoring the pH level allows for early detection of risks and implementation of appropriate preventive and intervention measures to extend the life of archival and museum materials.

¹ W. Sobucki, *Odkwaszenie papierów zabytkowych*, „Ochrona Zabytków” 2001, no. 54/1 (212), p. 63.

This article presents the results for a selection of 23 items, chosen from a much larger group of analysed materials. They were grouped according to their nature and function: musical autographs, correspondence and others, and musical first editions. The vast majority of these objects have undergone at least one conservation treatment that interferes with the entire structure of the paper, which further justifies the need for a regular evaluation of their chemical stability. The results presented here provide a starting point for a discussion of the impact of previous conservation interventions on the current state of the materials, as well as directions for further conservation efforts for the Chopin collection.

General condition of the collection, conservation history, characteristics of added elements

The described part of the examined collection consists of 15 musical autographs, 3 letters, 2 items in the other category, and 3 volumes of collections of musical first editions from the composer's times. Their overall condition can be classified as good, which was certainly influenced by the status of the musician himself, a composer who was famous during his lifetime. Even then, his autographs, letters and memorabilia were valued, collected and carefully preserved. The first repairs, rather makeshift and unprofessional, which can still be noticed on new acquisitions, were made already at that time. Successive custodians of the collection – starting with the Fryderyk Chopin Society and ending with the Fryderyk Chopin Museum at the Fryderyk Chopin Institute – make all possible efforts to keep the collection in the best possible condition. They provide conservation care and separate, secure storage rooms for the museum's artifacts. The climate in the places where the collection is stored and displayed is constantly controlled (since 2016 electronically, in the 1990s and 2000s by means of records), the warehouses are equipped with air purifiers, humidifiers and dehumidifiers, with separate air conditioning since 2023.

Musical manuscripts vary in terms of the paper used. The fiber composition of the manuscripts has never been examined due to the need to take a sample and deplete the original. Very often they were written down on good-quality material, resilient, flexible, with visible watermarks, sometimes with preserved paper-making marks on the edges. Works intended for the publisher were written down on sturdier, thicker, better-quality paper types. Works that were intended as gifts were written down on beautiful, decorative papers with intricately embossed borders, and quick drafts and excerpts of works are found on various scraps of mediocre quality. Correspondence is written on fine paper. It is in the case of letters that the most drastic examples of ink corrosion in the form of cracks and losses are noticeable. In contrast, first editions of Chopin's works were printed on rather thick handmade paper, stapled into volumes without additional secondary dividers.

Among musical autographs, we distinguish between works that fit on a single sheet, to which free conservation sheets were glued on the fold, and multi-page works on separate sheets gathered together or folded – here, in turn, the free sheets were sewn between the original sheets. The letters have double-page dust covers of acid-free paper, hinged using a strip of tissue paper. Chopin's drawings were similarly put together, the dust covers additionally sliding into linen strips in the hardcover.

All this is done to ensure the stability of the pH of the original papers, which cannot be bathed – so that the conservation card is the first to meet the hands of researchers, and therefore support the original.

Acidification of papers and ink corrosion are the main and most serious conservation problems affecting the Frederic Chopin Museum's paper collection. It is difficult to consider either of these issues separately, especially since they constantly and directly interact with each other. Most of the items are written in metal-gall ink. The exceptions are drawings, musical first editions and one musical autograph written in pencil. The inks show varying states of preservation, ranging from initial signs of corrosion visible in the form of a brownish halo around the marks, through the migration of iron ions through the paper

structure to the other side², to localised individual cracks³ at points of significant concentration of the writing medium.

Some of the items show clear traces of use – dirt, stains, damp patches. There is a noticeable tendency in previous restorations to leave a certain degree of dirt (in a way, witnesses of Chopin's life) and not to clean thoroughly at all costs. Paper folds are frequent, at times turning into tears. Each of the described items has been conserved at least once, though for only three it was not possible to discover any conservation documentation⁴.

While analysing the preserved conservation documentation – the program of works, the course of conservation and the list of treatments eventually carried out – a restrained approach is noticeable and the limitation of activities to those absolutely necessary. In addition to cleaning, regluing of tears and restoration of defects, a fixed point of conservation in the 1960s was the addition of binding. The multi-page works were stapled together with paper dividers, then free sheets were added before and after the block to separate the original from the binding. The works on single sheets received free sheets glued on the fold to the left edge, collected to form a single volume in a shared binding. Blocks were most often bound in hard covers, then pulled into an all-leather, rarely in cloth. The cover has the title of the content embossed in gold. In addition, the bindings come with slip cases or in the form of a clamshell box. The original sheet is surrounded and shielded by many layers of papers, cardboard, leather, linen and adhesives, the pH of which is often acidic (photograph 1).

The restorations carried out in 1997–1998 primarily examined the condition of the papers. They mainly deacidified the items, but also dividers and endpapers. Among the deacidifying agents, $\text{Ba}(\text{OH})_2$ in methanol predominates, sometimes

² „Halos” around the marks and punctures of the writing on the verso side affect all inked manuscripts discussed in this article.

³ Cracks caused by corrosion affect items M/232, M/233, M/99 [item's details, like the title, are given in the table].

⁴ M/307, M/232, M/429 [item's details, like title, given in table].



Photo 1.

Mounting of item M/458 slipped into cloth strips in hardcover (photograph by D. Długosz-Jasińska)

used twice. After the tests performed on the water resistance of the inks, $\text{Ca}(\text{OH})_2$ was used in several cases, and this agent was also used at the stage of structural reinforcement, introduced into the paper as an “alkali reserve” with methylcellulose. In the case of some objects, the results of pH measurements after conservation were dated and written on a free card or on an endpaper next to the object (photograph 2). At the time, dust covers or free sheets of paper specified as acid-free were added to some of the manuscripts, and the name “Palatina” was specifically mentioned in some of the documentation.



Photo 2.
Entry on the pH level on the endpaper after the 1998 conservation (photograph by D. Długosz-Jasińska)

Item no.	Item details	Structure	Type of paper and writing media
Musical autographs			
M/198	F. Chopin, <i>Impromptu in A-flat major, op. 29</i> Complete edition autograph	6 k. of the original, 5 free k. before and after the original, dividers between original k. Leather hardcover	Ribbed paper, metal-gall ink
M/199 s. 1–5 M/200 s. 6–10 [co-bound].	F. Chopin, <i>Nocturne in C minor, op. 48 no. 1</i> <i>Nocturne in F sharp minor, op. 48 no. 2</i> Complete editing copies for the publisher	10 k. of the original, 5 free k. before and after the original, without dividers in the block. Leather hardcover	Machine paper, metal-gall ink

Item no.	Item details	Structure	Type of paper and writing media
Musical autographs			
M/232	F. Chopin, <i>Sonata in G minor, op. 65 for piano and cello</i> Sketch autograph of fragments of the work	36 k. of the original, transcript on 46 s., each k. of the original with added free conservation k. Bound in hard cloth (unstitched)	Machine paper, metal-gall ink
M/233	F. Chopin, <i>Barcarolle in F sharp major, op. 60</i> Sketch autograph of fragments of the work	1 k. of the original with added free conservation k. One-sided writing	Machine paper, metal-gall ink
M/234	F. Chopin, <i>Sonata in B minor, op. 58</i> Sketch autograph of fragments of the work	1 k. of the original with added free conservation k. One-sided writing	Machine paper, metal-gall ink
M/235	F. Chopin, <i>Mazurek in F minor, op. 68 no. 4</i> Sketch autograph, outline of the entire work	1 k. of the original with added free conservation k. One-sided writing	Machine paper, metal-gall ink
M/236	F. Chopin, <i>Mazurek in F minor, op. 68 no. 4</i> Copy – reconstruction by the hand of Auguste Franchomme	1 k. of the original with added free conservation k. One-sided writing	Machine paper, metal-gall ink
M/240	F. Chopin, <i>Sketches of Two Musical Thoughts [...]</i>	1 k. of the original with added free conservation k. One-sided writing	Machine paper, metal-gall ink
M/300	F. Chopin, N. de Rothschild, <i>Nocturne in C minor</i> Sketch autograph, outline of whole, decomposed	1 k. of the original with added free conservation k. One-sided writing	Machine paper, metal-gall ink

Item no.	Item details	Structure	Type of paper and writing media
Musical autographs			
M/307	F. Chopin, <i>Score in the key of E-flat major for piano</i> Sketch autograph of a fragment of a work	1 k. Original with one-sided recording, 2 free k. before and after the original	Ribbed paper, metal-gall ink
M/339	F. Chopin, <i>Polonaise in F minor, op. 71 No. 3</i> Autograph, gift of entire work	3 k. of the original with both sides transcribed, 4 free k. before and after the original, dividers between original k. Hardcover in full leather with case	Machine paper with embossed borders, metal-gall ink
M/500	F. Chopin, <i>Impromptu in F sharp major, op. 36</i> Sketch autograph of a fragment of a work	1 k. of the original with both sides in writing, with a free k. for conservation	Machine paper, metal-gall ink
M/603	F. Chopin, <i>Interpretation of a Romanian folk song [...]</i> Sketch autograph of a fragment of a work	2 k. of folio with a free conservation k. Transcript on p. 1 R	Machine paper, graphite
M/429	F. Chopin, <i>Sketches for "The Method of Piano Playing"</i>	7 k. of the original with entry on s. 9, 4 free k. before and 5 after the original, without dividers in the block. Hardcover in full leather	Machine paper, metal-gall ink
Correspondence and others			
M/99	Letter from M. Sand and F. Chopin to G. Sand at Nohant dated 4.11.1843	2 k. Folio with notation on each s. Glued in a dust cover, which slides into the assembly on cotton strips in hardcover binding	Machine paper, metal-gall ink, graphite

Item no.	Item details	Structure	Type of paper and writing media
Correspondence and others			
M/237	Letter from F. Chopin to J. Fontana in Paris, dated 8.11–15.11.1838	2 k. Folio with notation on each s. Glued in a dust cover, which slides into the assembly on cotton strips in hardcover binding	Machine paper, metal-gall ink
M/271	Letter from F. Chopin to J. Fontana in Paris, dated 29.09.1839	2 k. Folio with notation on each s. Glued in a dust cover, which slides into the assembly on cotton strips in hardcover binding	Machine paper, metal-gall ink
M/428	F. Chopin's calligraphy notebook from the period of study at the Warsaw Lyceum, 1823–1824 (?)	14 k. of the original, 6 s. of notation, 3 free k. before and after the original, without dividers in the block. Hardcover in half-leather and paperback	Handmade, ribbed paper with watermarks, metal-gall ink
M/458	F. Chopin, <i>Landscape with Windmill</i> Around 1825	1 k. of the original with added free conservation k., 2 free k. before and after the original, inside linen strips for insertion of the item. Hardcover in linen	Handmade paper, charcoal, graphite, chalk
Musical first editions			
M/174	Collection of first editions and later printings of first editions of French works by F. Chopin, 1833–1845; annotations by F. Chopin	144 k. of the original, 5 free k. for conservation before and after the original. Secondary bookbinding hardcover in half canvas and paper	Handmade paper, printing with black ink

Item no.	Item details	Structure	Type of paper and writing media
Musical first editions			
M/175	Collection of first editions and later printings of first editions of French works by F. Chopin, 1833–1850; annotations by F. Chopin	172 k. of the original, 5 free k. conservation before and 6 after the original. Secondary bookbinding hardcover in half canvas and paper	Handmade paper, printing with black ink
M/176	Collection of first editions and later printings of first editions of French works by F. Chopin, 1840–1850; annotations by F. Chopin	147 k. of the original, 5 free k. for conservation before and after the original. Secondary bookbinding hardcover in half canvas and paper	Handmade paper, printing with black ink

Legend: k. – card, s. – page, R – recto, V – verso

Purpose of the study

The aim of the study was to check the level of acidity of collections written on paper and their secondary elements added over the years during various conservation procedures. The goal was to trace the fluctuations in the pH levels of the original papers, as well as the elements directly adjacent. “Added elements” included any components permanently attached to the items, namely: certain local repairs (e.g., underlinings, restorations, leaf casting) and free conservation cards, dust covers and secondary bindings. There was also the objective of determining whether the added parts still meet standards and whether their proximity raises or at least stabilises the pH level of the original papers, or whether they already have a degrading effect. The research endeavour was to verify the condition of the secondary elements and help make further decisions and undertake possible conservation measures

to ensure the best possible storage conditions, stop the process of degradation, or, if possible, improve the state of the items.

Adopted criteria and research methodology

For the purpose of this article, the results presented apply only to a narrowed pool of items, only the most representative of each category. The main criteria were the creation during the Chopin era and having elements added permanently during past conservation. The largest group is musical autographs. There is a small number of letters because of their reactive matter and high risk of damage during examination, with a few items in the “other” category being Chopin’s drawing and his calligraphy notebook. Three volumes of musical first



Photo 3.

Item M/428 during measurement (photograph by D. Długosz-Jasińska)

editions contain many notebooks of editions from different years. The choice of items was dictated primarily by the safety of conducting the research. Already at the beginning, it was assumed that some very thin papers, such as letters, would probably react strongly, so the testing was not performed in some cases. Measurement spots on the original cards had to have an ink-free area on both sides, three times the diameter of the electrode base to avoid creating conditions conducive to aggravating the ink corrosion problem (photograph 3). Efforts were made to minimise the effect of water as much as possible so that no deformation or streaking would occur. Therefore, drip tests were performed as early as the preparation stage of the study, with a prepared workshop for instant drying.

The test was conducted using the contact method, in accordance with PN-EN ISO 6588-1:2013-01, with a SevenCompact S220 pH meter from Mettler Toledo, with an InLab Surface Pro-ISM flat-bottomed electrode. The device was calibrated in three buffer solutions from the same company: pH 4.01, pH 7.00, pH 9.21. Distilled water was used during the measurements.

Findings

How to read the table: The measurement applies to the original place only if the word “original” is specified in the place column. The data in the column “results of past measurements” refers to the conservation in the last column marked in bold.

Item no.	Location of current measurement	Result of current measurement	Results of past measurements	Data on past preservations
Musical autographs				
M/198	Free card before the title page	6.8	Dividers before 5.1; after 8.0	1960s. – binding
	Original k. 4 V	7.3	Original before: 5.3–5.6; after: 7.7–8.2	1997 – Deacidification with Ba(OH)₂ in methanol

Item no.	Location of current measurement	Result of current measurement	Results of past measurements	Data on past preservations
Musical autographs				
M/199 M/200 [co-bound].	Free k. before the manuscript	5.7	Endpaper card, after 7.3	1965 – water-coating of margins, binding 1998 – Deacidification with a 1% alcoholic solution of Ba(OH) ₂
	Original V	6.2	Original before 5.0–5.6; after 7.0–7.6	
	Free k. after manuscript	6.4	Endpaper card before 5.1; after 7.3	
M/232	Free k. added to the title page	5.3		
	Original k. with title	6.3		
	Free k. added to k. 19/20	6.6		
	Original k. 19/20	6,0		
	Free k. added to 71/72	6.6		
	Original k. 71/72	6.6		
M/233	Free k. added, in the middle	7.0		1963 – binding 1997 – Deacidification in an aqueous solution of Ca(OH) ₂ , regluing with an aqueous solution of methylcellulose in Ca(OH) ₂ , repeat deacidification in Ba(OH) ₂ in methanol
	Original, V in the middle of the left edge	6.7	Original before 5.9; after 1. deacidification 6.5	

Item no.	Location of current measurement	Result of current measurement	Results of past measurements	Data on past preservations
Musical autographs				
M/234	Free k. added, in the middle	6.6		1963 – binding 1997 – Deacidification in an aqueous solution of Ca(OH)_2 , regluing with an aqueous solution of methylcellulose in Ca(OH)_2 , repeat deacidification in Ba(OH)_2 in methanol
	Original, V left edge in the middle	6.8	Original before 5.1; after 1. deacidification 6.1; after 2. deacidification 7.0	
M/235	Free k. added, in the middle	5.8		1963 – binding 1994 – Separation from secondary binding; no deacidification treatment; added free k. conservation
	Original, V on the left from the addition	5.9		
	In the sheet of the original, V top addition	6.4		
M/236	Free k. added	6.6	After rinsing in water 6.6; after deacidification 7.9	1960s. – binding 1994 – Separation from secondary binding; no deacidification treatment; added free k. conservation 1997 – Rinsing in water, deacidification with 1% alcoholic solution of Ba(OH)_2
	Original, V in the middle of the left edge	6.7	Original – after rinsing in water 6.3; after deacidification 7.9	

Item no.	Location of current measurement	Result of current measurement	Results of past measurements	Data on past preservations
Musical autographs				
M/240	Free k. added	6.8		1962 – binding 1997 – Deacidification with 1% alcoholic $\text{Ba}(\text{OH})_2$ solution, free “palatine” cards with pH 8.1 were added
	Original, V in the middle of the left edge	6.7	Original before 5.1; after 7.1	
M/300	Free k. added, in the middle	6.5		1963 – binding 1997 – Deacidification in an aqueous solution of $\text{Ca}(\text{OH})_2$, regluing with an aqueous solution of methylcellulose in $\text{Ca}(\text{OH})_2$, repeat deacidification in $\text{Ba}(\text{OH})_2$ in methanol
	Original, V in the middle	6.9	Original before 5.4; after 1. deacidification 6.2; after 2. deacidification 7.4	
M/307	First free k. after the manuscript	5.0		No maintenance date. Visible repairs with tissue paper
	Original V	4.1 [or less]		
M/339	Free k. between 1 and 2 k. of the original	6.3	Divider before 4.8, after 8.3	1963 – binding 1997 – Deacidified twice with 1% alcoholic solution of $\text{Ba}(\text{OH})_2$
	Original, k. 3, V in the middle of the left edge	6.7	Original s. 2 before 5.3, after 8.2; s. 5 before 5.4, after 8.4	

Item no.	Location of current measurement	Result of current measurement	Results of past measurements	Data on past preservations
Musical autographs				
M/500	Free k. added	6.4		1963 – binding 1997 – Deacidification in an aqueous solution of Ca(OH) ₂ , regluing with an aqueous solution of methylcellulose in Ca(OH) ₂ , repeat deacidification in Ba(OH) ₂ in methanol
	Original, V in the middle	6.9	Original before 6.1; after 1. deacidification 6.4	
M/603	Free k. added	6.8		1973 – without deacidification treatments 1997 – Deacidification with a 1% alcoholic solution of Ba(OH) ₂
	Original, k. 2, R in the middle of the right edge	6.7		
	Original, k. 2, R stain	6.9	On the stain before 5.2; after 7.3	
M/429	Last free k. before the original, V	4.6		Unknown conservation date. Visible repairs with Japanese tissue paper
	Original, s. 8	5.1		
	Original, s. 14, gluing of lower left corner	5.3		
Correspondence and others				
M/99	Dust cover	6.9		1998
	Original, k. 2 R	6.2	7,0	
	Free k. bindings	6.6	Cards 7.6	

Item no.	Location of current measurement	Result of current measurement	Results of past measurements	Data on past preservations
Correspondence and others				
M/237	Dust cover	7,0		1998 – Deacidification with 1% alcoholic Ba(OH) ₂ solution, acid-free paper mats added
	Original k. 2 V	6.6	Original before 4.9, after 7.1	
M/271	Dust cover	6,4		1998 – Deacidification with 1% alcoholic Ba(OH) ₂ solution, acid-free paper mats added
	Original, k. 2 R	7.1	Original before 4.8, after 7.7	
M/428	Last free k. before the original, V	4.9		1964 – without deacidification treatments, binding
	Original, k. 5 R in the middle of the top edge	4.6		
	In the original sheet, k. 27 R addition to the top edge	5.3		
	In the original sheet, k. 27 V in the middle of the right edge, leaf casting	6.0		
M/458	Dust cover	6.9		1964 – without deacidification treatments 1998 – Deacidified twice with 1% alcoholic solution of Ba(OH) ₂ , mats of acid-free paper were added
	Original V	7.0	Original before 4.9, after 7.3	
	Free k. bindings	5.9	Padded cards before 5.1, after 7.9	

Item no.	Location of current measurement	Result of current measurement	Results of past measurements	Data on past preservations
Musical first editions				
M/174	Last free k. ahead of print V	6.2		1964 – Water baths, coating in sodium fluoride gelatin, binding
	Original, k. 1 R	6.1		
	Original, k. 82 R	5.9		
	Original, k. 144 R	5.6		
	First free k. after print	5.3		
M/175	Last free k. ahead of print V	5.6		
	Original, k. 1 R	5.6		
	Original, k. 80 R	6.0		
	Original, k. 172 R	6.5		
	First free k. after print	6.7		
M/176	Last free k. ahead of print V	5.3		
	Original, k. 1 R	5.9		
	Original, k. 52 R	6.2		
	Original, k. 123 R	6.3		
	Original, k. 123 R addition	5.8		

Legend: k. – card, s. – page, R – recto, V – verso

Conclusion and summary

After the restorations that took place about sixty and thirty years ago, decreases in the pH level were noted in all the conserved items, as well as the added elements. The greatest acidification concerns papers that probably never underwent any deacidification treatment, and the only traces of professional

interference are the glued tears and attached free pages. The pH of these historical artefacts oscillates around 4.1 to 5.9. Manuscripts deacidified with a 1% solution of $\text{Ba}(\text{OH})_2$ in methanol after almost thirty years show pH drops with a wide range from 0.4 all the way up to 2.0. The addition of dust covers and dividers made of acid-free "Palatina"⁵, as indicated in the 1990s documentation, kept the drops of the originals at 0.6 and less.

The most sustainable effects over time were produced by deacidification treatments in an aqueous solution of $\text{Ca}(\text{OH})_2$ and repeated deacidification of $\text{Ba}(\text{OH})_2$ in methanol. After almost thirty years, the pH levels of the original papers have been reported to have dropped by 0.2 – which at the same time may be within the margin of measurement error. It should be remarked that the pH value can vary within a single sheet: the acidity of a blank area will be different to that of written areas, such as those affected by corrosion, so the type of care and restrictions should be adapted to the "weakest link" of the item.

Papers added in the 1960s show acidification levels ranging from 4.6 to above 6.0, but the higher values apply to items that have since been deacidified. Dust covers and free cards added in the 1990s have a pH above 6.0.

The only item without metal-gall ink, unaffected by ink corrosion – M/603 with graphite writing – shows a pH value of 6.7, and the added free card has an even higher value. This manuscript was deacidified once with a 1% solution of $\text{Ba}(\text{OH})_2$ in methanol.

The collection of first prints, despite one conservation in 1964 when the cards were bathed in water and sealed with gelatin, shows values between 5.6 and 6.5. Currently, the secondary additions to the block of free conservation cards are in a worse condition, most below 6.0.

⁵ The „Fabriano Palatina” paper is an acid-free type with high durability and a pH level in the range of 7.1–8.1. *Badanie właściwości papierów i tektur stosowanych do ochrony zbiorów muzealnych w Pracowni Konserwacji Papieru i Skóry Muzeum Narodowego w Krakowie*, in: D. Okrągła i in., *Zasady postępowania z obiektami zabytkowymi na podłożu papierowym*, series „Ochrona Zbiorów”, Cracow 2012.

In poor condition is item M/428, *Calligraphy notebook*. It's only documented conservation took place in 1964, as the documentation noted only the addition of a binding. Based on a visual inspection of the item, it is possible to find glueing of tears, restorations of defects and leaf casting on the Japanese tissue paper of the last page, which was a soft cover. Repairs and reinforcements no longer serve their purpose (photograph 4). Visually, the object is discolored, with visible significant color discrepancies between the original and added parts. The lack of water baths due to the presence of metal-gall inks and the absence of any deacidification translates directly into the low pH values of both the original and the free added cards or restorations.

Values of 6.0 and above were considered acceptable pH levels. Objects with a pH lower than 6.0 should be qualified for deacidification treatment. Added parts with pH level lower than the pH of the object they are in contact with should be separated as they are acidifying the original, even if their pH

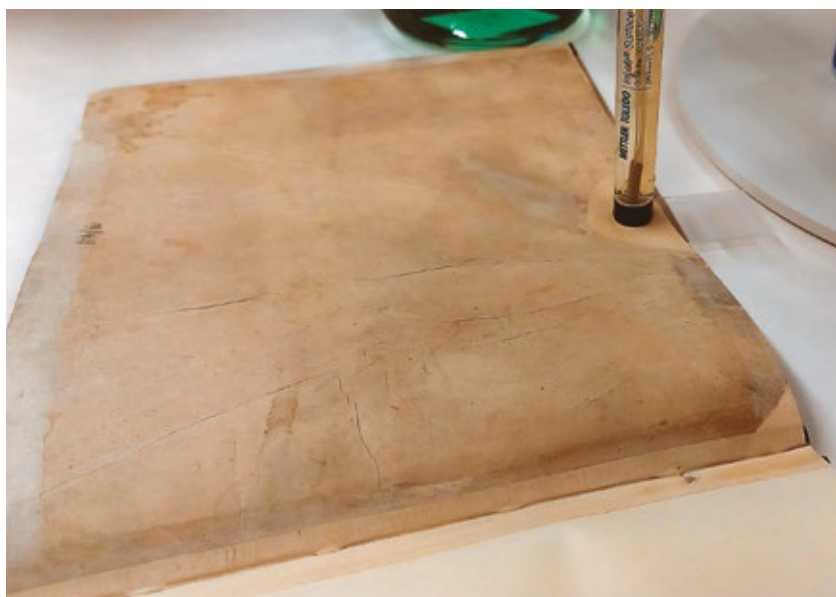


Photo 4.

The state of preservation of some of the cards of item M/428 (photograph by D. Długosz-Jasińska)

value is much higher than 6.0. Studies have shown that free sheets providing an alkaline buffer helped to maintain the optimal pH of the original paper, so it is recommended that separated parts be replaced with new ones, not permanently attached to the object. In the case of multi-page objects, where the marginal cards directly adjacent to the binding are more acidified, it is worth adding a new free card with an alkaline reserve or perform deacidification on several cards.

When introducing tissue reinforcements in conservation, it would be advisable to choose those with the appropriate pH level or, if they are acidic⁶, to undergo a deacidification treatment with an alkaline reserve, especially if the document requires leaf casting of the entire surface.

Taking care of the optimal pH level of the historical papers, in addition to preserving the strength of the material, will at the same time allow relative control over the corrosion of inks, since the catalytic activity of iron and copper ions is lowest at neutral pH⁷.

From the perspective of today's available methods of preserving items, while also being aware of the continuous development of techniques and technologies for the conservation of collections and possible future research opportunities, working on original manuscripts is limited to the necessary minimum to prevent degradation, and the methods and means selected in conservation must have an extensively documented effect. Priceless items require an individual course of action⁸. Baths in deacidifying solutions are being supplanted by newer, less invasive methods that allow preservation of the full information of the artefact. Spraying a deacidifying agent in a volatile solvent can be

⁶ Therein, p. 45.

⁷ M. J. Melo et al. *Iron-gall inks: a review of their degradation mechanisms and conservation treatments*, „Heritage Science” 2022, vol. 10 (1), p. 73.

⁸ M. Woźniak M., *Tradycyjna konserwacja na tle masowych technologii ratowania zbiorów XIX-XX-wiecznych*, in: *Zachowajmy przeszłość dla przyszłości. Nowoczesne technologie konserwacji zbiorów bibliotecznych*, series „Propozycje i Materiały”, Warsaw 2007, p. 21.

considered the safest option, while soaking the item in such a solution will be more effective, further preserving the brightness of the original paper⁹. However, it should be noted that by adding a deacidifying agent, even in the form of nanoparticles¹⁰ or by structurally reinforcing the paper¹¹, a new agent is introduced into the original matter, which forces changes. It is comforting to know that such a simple procedure as adding a buffer in the form of a free dividing leaf, which can be easily replaced, has proven quite effective over many years. Continuing to provide a buffer in the form of a free card (loose, not glued to the item) with a high pH will help to postpone more invasive measures. It must be remembered, however, that this is a supporting action and not a replacement for the deacidification treatment.

The current rather good condition of a significant part of the Chopin collection is owed to the then guardians of the collection – the Fryderyk Chopin Society and conservators and chemists, their awareness of the existence of a serious problem, which resulted in the creation of the long-term government program “Acid Paper”, as well as the activities of the Fryderyk Chopin Institute, which presupposes the pursuit of increasingly better conditions for storing and exhibiting museum artifacts.

⁹ S. D. Stauderman, I. Brückle, J. J. Bischoff, *Observations on the use of Bookkeeper Deacidification Spray for the treatment of individual objects*, „The Book and Paper Group Annual” 1996, vol. 15.

¹⁰ A. Kwiatkowska, R. Wojech, A. Wójciak, *Badania efektywności odkwaszania papieru alkoholową dyspersją tlenku magnezu o rozmiarach nanometrycznych*, „Notes Konserwatorski” 2018, no. 20; J. Cui et al., *Improved paper deacidification performance with CaMgO₂ nanocomposite in fluorocarbon solvent*, „Surfaces and Interfaces” 2025, vol. 67.

¹¹ For sensitive and weakened items, deacidification can be combined with structural strengthening in a single treatment. W. Sobucki, *Konserwacja papieru. Zagadnienia chemiczne*, Warsaw 2013, p. 159; M. Bračič et al., *Functional coatings with ethyl cellulose-calcium carbonate alkaline nanoparticles for deacidification and mechanical reinforcement of paper artifacts*, „Surfaces and Interfaces” 2025, vol. 60.

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