Materials Used in Conservation of Painted Wooden Objects in Estonia

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1. Introduction

The main purpose of conservation is to preserve art and other artefacts in such a condition that coming generations may experience them and study their value.

"*Conservation is defined as the process of dynamic management of change in order to reduce the rate of decay, and to prolong the life cycle of the concerned objects. The cultural, scientific and natural heritage must be conserved as authentic documents. Intervention should be limited to actions strictly necessary to insure the techniques and materials used should not impede future treatment or examinations."*

Any conservation/restoration process means an intervention at least of preventive nature. Interventions in practice always involve some loss of value and authenticity, but are justified in order to preserve the objects for the future.

Treatments in conservation of painted wooden objects, mostly considered as interventions, can be distinguish in two big groups:

- Cleaning
- Fixing (consolidation)

Materials used in these treatments can be divided in very generalised groups:

1. Cleaning mixtures
2. Synthetic polymers

In my subjective opinion fixing is the relevant process and with last 10 years I had to solve this more often that the others. Therefore my paper deals more with polymers than the solvents and cleaning mixtures.

2. Cleaning mixtures and Synthetic Polymers in the Conservation of Painted Wooden Objects

"There is no optimum restoration method, but only one technique deemed most suitable for the object in question" (I.Sandner)

It was known in England at the 19th century already that "the great danger in restoration is doing too much, and the great difficulty is to know where to stop". Selecting the right conservation material is like walking on a broken glass.

An important point is to select chemicals, i.e. cleaning mixtures and polymers for which the useful properties have been thoroughly tested. The choice of a material for conservation of a particular object must be made after consideration of the properties required for the material in situ, the method of application and the method of removal.

It seems, in this moment chemistry as a science and conservation as a practical (manual) skill contrasts more. Practical skills may develop without the necessary underpinning knowledge that allows their critical application; in this case, conservators become merely skilled technicians.

Conservation education could be distinguish in different parts – until Estonian Republic was re-established it was possible to study in Russian academic schools. About 10 conservators still working had used this possibility and they have very good practical skills. But there is a quite big blank, about 15 years, between these two parts. The knowledge of younger generation comes from more experienced colleagues and/or they are self-educated. Nowadays it is possible to go to study abroad, p.ex. Finland and Sweden.

This problem has lead to situation conservators (in Estonia, but is it here only?) have to collect and still are collecting data from different sources:

- Media: articles, books, internet
- Experience: others experience, seminars, workshops, courses. This means we trust in others experience

From this information conservators select materials, optimum in each case, considering working conditions and easy handling, also. These choices are mostly based on intuition.

2.1 Cleaning mixtures

Last 10 years the utilization of the newest solvents and mixtures has not been so quick as polymers ones. In addition to "traditional" solvents only few new recipes have been used. As traditional we can probably name Turpentine, Ethanol, Ethyl acetate, Propanol, etc. and these solvents are still in usage. Few years ago very strong solvents like DMF – Dimethylformamide and Cellosolve (2-Ethoxyethanol) were used. As the new cleaning mixtures, at least in Estonia, some solvent gels and solutions, where the active component is surfactant, etc. could be named.

For removing surface dirt we started to use triammoniumcitrate (TAC) water based solution instead of soap, which was recommended as the best, before. We had used it firstly in 1999 for cleaning the Lunette paintings, 1667, in Tallinn Town Hall. Until now we have not noticed any reactions which could limit the usage of TAC.

Examples from the stronger solvents which purpose is to remove old varnish layer or over paintings are given in table 1.

Table 1

Year	Cleaning agent	Object
1996	Gel from cellosolve, 40% ethanol, turpentine, few drops of NH4OH, KMC, removing with ethanol (GEL 1)	Altar in Tallinn Dome Church
1997	Gel from cellosolve, 40% ethanol, turpentine, few drops of NH4OH, KMC, removing with ethanol (GEL 1)	Pulpit in Karja Church, first part of 17th century, Saaremaa island
1999-2000	a) Gel from cellosolve, 40% ethanol, turpentine, few drops of NH4OH, KMC, removing with ethanol (GEL 1); b) Gel from acetone, benzyl alcohol and Ethomeen C25 with Carbopol 925, removing with acetone (GEL 2)	Pulpit from 1686 and 1720 in Tallinn Dome Church
1999-2000	a) Mixture of ethanol-acetone-turpentine b) Gel from acetone, benzyl alcohol and Ethomeen C25 with Carbopol 925, removing with acetone (GEL 2)	Coat of arms of J.Hobing, Estonian Art Museum, Tallinn

In practice we observed a big difference of using properties of GEL 1 and GEL 2 – the application of the second one is easier, it works better etc. The other question is: how good the cleaning mixture has to work or how clean should the surface be.

2.2 Polymers and possible applications in the conservation of painted wooden objects

Natural and synthetic polymers have always been used in objects as adhesives, consolidants and coatings.

Until the fifties-sixties of 20th century, mostly natural products such as dammar, mastic, beeswax, fish glue, etc. could be used for these purposes. Now, a lot of synthetic polymers are available and it becomes difficult to make a choice.

In conservation of painted wooden objects five polymer groups have been used.

1. Vinyl acetate derived polymers
2. Acrylic polymers
3. Polyethers
4. Polymers derived from cellulose (used before by paper conservators)
5. Polymer from the group of tertiary amides.

2.2.1 Consolidation of wood with polymers

Consolidation is needed then wooden artefacts are so weak that they are not possible to exhibit, use, transport etc.

Consolidation is irreversible, so in this process there is need to use materials of proven stability. The minimum (optimum) amount of consolidant should be incorporated in an object.

The easiest way to introduce a polymer into a porous material is by dissolving the polymer in an appropriate solvent and applying this solution to the object.

Although this method is easy to perform there always exists a risk of the appearance of a chromatographic effect. The result is in many cases a consolidated surface layer, which is in danger of peeling off if the object is exposed to unstable environmental conditions.

Examples:

(*) remarks polymers as consolidants, which usage is ended or not widespread. Anyway, we have to deal with objects treated with these polymers.

1. Vinyl acetate derived polymers:
   - Polyvinylacetate P(VAC)*
2. Acrylic polymers:
   - Polybutylmethacrylate P(BMA)* (the exact chemical composition should be determined during the research, as the formula from literature can be different).

   There are some cases of icon panel immersion made by the private conservators in this year
   - Copolymer of butylmethacrylate and 5% methacrylic acid P(BMA/Methacrylic acid)* (the same remark)
   - Copolymer of methylacrylate and ethylmethacrylate P(MA/EMA), Paraloid B72

   Used nowadays
3. Polyethers:
   - Polyetylenglycol (PEG)*

   Has been used for immersion of icon panels

From natural materials, a mixture of wax and resin have been used as consolidant. Its problematic application and removing as the need of controlled exhibition conditions has lead conservators to usage the synthetic polymers like Paraloid B72.

2.2.2 Fixing

The choice of a fixing agent depends on nature and condition of the support, on type and condition of the polychrome, also. Ancient art objects can be over painted and materials in different paint layers can be of different nature.

Sometimes the choice depends also on the aim of the process: is it conservation or restoration? Conservation consists of fixing of paint layers with over paints. In this case it is definitely necessary, that the adhesive will be retreatable.

There exists an extensive choice of adhesives on the market, but conservation problems can be solved by a limited number of products.

Examples:

(*) remarks polymers as adhesives, the use of which is ended or not widespread. Anyway, we have to deal with objects treated with these polymers

1. Vinyl acetate derived polymers:
   - Polyvinyl alcohol P(VAL)
   - Polyvinyl acetate P(VAC)
   - Copolymer of vinyl acetate and 2-ethylhexylacrylate P(VAC/EHA)*
   - Copolymer of vinyl acetate and ethylene P(VAC/ethylene)*

   The main problem encountered with these kinds of glues is that they are, in most cases, too good adhesives. Care should be taken that the new bond is not stronger than the original material, in order to avoid new damage when tensions occur in the object.
2. Acrylic polymers:
   - Poly-n-butylmethacrylate P(nBMA)*
   - Copolymer of methylacrylate and ethylmethacrylate P(MA/EMA)

   Acrylics like n- or iso-butyl methacrylate have the advantage that they are soluble in white spirit, but their stability is much lower than that of P(MA/EMA) - Paraloid B72.

   The stability of Paraloid B72 has been proved over and over again and the resin is even used as a reference material in Feller's classification of stability.
3. Cellulose derivates:
   - Hydroxypropycellulose - Klucel GF
4. Tertiary amides polymeric material
   - monomer 2-ethyl-2-oxazoline (PEOX) - Aquazol

Table 2 Examples of used polymers in conservation of painted wooden objects

Year	Polymer	Notes	Object
1997	7% Paraloid B72 in toluene, traces of glue with acetone	Fixing of residues of original paint layer and over paints (oil paint) to the base	Pulpit from first part of 17th century in Karja Church, Saaremaa Island
1998-2002	7% Acronal 500, traces of glue with acetone	Fixing of residues of original paint layer and over paints (oil paint) to the base	Pulpit from 1709 in Hanila Church, Western Estonia
1999	5% Plexisol P500 in white-spirit, traces of glue with acetone	Outdoor object, B72 did not work	Clock from 1684 on the wall of St Holy Church, Tallinn
1999-2000	5% Plexisol P500 in white-spirit and 5% Paraloid P72 in toluene	Fixing of residues of original paint layer and over paints (oil paint) to the base	Pulpit from 1686 and 1720 in Tallinn Dome Church
2000	10-20% Aquazol in water, few drops ethanol added	Fixing of very thick gesso layer with gilding	Iconostasis from 1720 in Orthodox Church in Tallinn
1998-	5-7% rabbit glue in water	Fixing of ground layer with polychrome	Coat of arms of I.von Essen, Estonian Art Museum, Tallinn
2000-2001	10% Klucel GF in ethanol	Fixing of thick ground layer with polychrome and gilding	Relief “The Coronation of Mary” from first part of 16th century in Saaremaa Museum
2000-2001-2002	10% Aquazol in water, few drops ethanol added	Fixing of residues of original paint layer and over paints (oil paint) to the base	Pulpit from 1632 and 1707 in Swedish St. Michael Church, Tallinn

Beside of Paraloid B72 the use of the Klucel and Aquazol is increasing. These adhesives are easy handled by the conservators – they are alcohol or water solutions, residues are removable slightly, etc. It seems, the only negative side of Klucel and Aquazol is they are not so good glues as “white glues”.

We observed good properties of Aquazol especially then fixing thick ground layers. No other glue makes so good contact with wood and ground as Aquazol. But, ... being tested in conservation only few years, it is not possible to value the effects of fixing in longer perspective.

Still we use the natural glue – rabbit glue, which is irreplaceable in conservation of gilding, but even there, we have tried Aquazol.

3. Conclusion

All human calculation in conservation is prone to individual error.

As mentioned before, selection of conservation materials by Estonian conservators is slightly unsure. Conservators miss secured background, they lack well argumented recommendations.

The evaluation of used conservation materials, the old and new ones, through practice and through conservation results could be the link between conservation scientists as chemists and conservators as technicians. The general scheme of evaluation of conservation materials could be universal for each material – textile, paper, leather etc.

In Estonia, there economical resources are limited even for safeguarding the cultural heritage, the possibilities for research are more difficult to organise. There are three institutions, like Tartu University and Tallinn Technical University from academic side and

Conservation Centre Kanut from practical side, who could be the base and the partners of research and testing of new materials and methods for conservation. Anyway, for Estonia the only opportunity is to take part in special programs in Europe or in world-wide projects.