

# **POLYMERS IN RESTORATION MONUMENTS. REQUIREMENTS OF RESTORERS TO POLYMERS**

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The polymers in conservation and restoration of cultural objects have to meet a lot of specific requirements.

1. The polymers have to be transparent, colourless, chemically inert and have not to lose the stability of these properties for a period of time which is needed. The polymers have not to be coloured on storage, during their use or un interacting with an exhibit or environment.

2. The polymers have to be "reversible", i.e. to possess the ability of complete removing from the restoration object after a prolonged storage. The exhibit has to maintain its own properties and texture. The polymer should be removed by dissolution or other method. On storage the polymer macromolecules have not to be cross linked under the action of various factors, namely, oxygen, light, solvent vapors, environment and the object itself etc.)

3. The polymers and based-on-them compositions have to possess predetermined physico-mechanical properties, such as strength, flexibility, fragility and durability. Besides, they have to show required thermomechanical properties such as glass transition, yield, softening and melting temperatures.

4. The polymers have to possess fairly high adhesion to the surface of the object, to be soaked well in the object pores (in the form of a solution). The adhesion of the polymer to the exhibit has to be achieved due to reversible physical interaction.

In this case a chemical reaction or irreversible chemisorptions is not permissible. It is necessary to foresee the possibility of moving (concentration) of polymer onto the surface or in the volume of the object. The concentration is realized by the choice of the composition of mixture of solvents and precipitators for the polymer.

5. Amorphous polymers have to possess a glass transition temperature that excludes cold flow. This parameter is controlled by changing functional groups and the structure of a homopolymer chain, the composition of copolymer and its molecular-weight distribution.

6. Polymer films, adhesive layers, various coatings and polymeric ingredients in the object volume have to show sufficient vapor- and gas-permeability. This is achieved by the change in the chemical nature of the polymer, the choice of conditions for its absorption in the object volume and of the composition of a solvent mixture. The regulation of composition of a dissolving medium by means of the selection of liquids with different vaporability allows altering the porosity of material. Here there is much, in common with the production of polymer porous membranes.

7. Polymer compositions (adhesives-solutions, dispersions, mastics, adhesives-melts, filled systems, plastisols) have to possess a desired combination of rheological and structure-mechanical properties. The above characteristics determine the spreading of a coating layer over the object surface, the rate and depth of permeability of polymer solution into pores and the distribution of an adhesive layer over the surface of the object to be glued. Thixotropy of filled polymer solutions used as mastics and finishing masses depends upon the structure-rheological properties. Rheological behavior of systems is controlled by changing molecular mass, chemical composition and structure of polymers, the solvent nature and the introduction of a filler

8. Resistance of polymer materials to biodestructive subjects results from the introduction of biocide fragments into macromolecules or biocide components into the composition.

9. Polymers have not to contain monomer residues and impurities, which give rise to darkening, destruction and cross-linking as well as substances injurious for the restoration objects.

10. Polymers have to be prepared in the form suitable for their use (powder, granules, solution, dispersion, latex, polymerizing systems etc).

11. Liquids used as solvents or dispersion media have to show inertness to the polymer, objects to be restored and non-toxicity. The last requirement is especially important in the conservation of monumental objects under field conditions and in unpractical buildings.

12. Specific demands on polymer conserving agents include the maintenance of the object texture after the restoration, the compatibility of new conserving agents with old ones, the availability, low cost, applicability of conserving agents for a wide range of exhibits both under field and laboratory conditions. On substituting polymers of one type for the other it is important to take into account the habit of restorers to a certain class of polymers. The above requirements are satisfied mainly by a goal-directed synthesis of copolymers and the preparation of compositions based on them.