

## RESEARCH ON CHEMICAL PRESERVATION OF TIMBER OF HISTORICAL MONUMENTS FROM EXTERNAL INFLUENCES

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*The tree is sensitive to the effects of abiotic factors (non-biological origin), such as fire, sunlight, water, oxygen and others, as well as damage to biological pests, bacteria, fungi, insects, birds, etc. The longevity of less resistant wood species is increased by the use of chemical protection such as fungicides and insecticides. Often, flame retardants and other preservatives are also used to improve the quality of wood.*

**Introduction.** On the one hand, it is the right choice of wood in favor of more durable wood species. However, you cannot underestimate the structural protection of wood, which is the creation of ideal conditions to suppress the influence of abiotic and biotic pests. Chemical protection of wood is also irreplaceable, and it is treated with substances with a biocidal, hydrophobic or fire-resistant effect. Modern technologies also provide wood protection modification, which performs thermal and enzymatic treatment of substances directly in wood cells in order to increase resistance to biological pests and increase hydrophobization. Some defenses are also biocontrolled when microscopic fungi or bacteria are planted on the wood, which prevents the subsequent attack of dangerous wood-destroying organisms.

The authors consider it expedient to abandon the classification of chemical means of protection, which is usually set forth in educational and reference literature on wood protection. It seems more logical to characterize simple inorganic and organic compounds that are part of multicomponent drugs used in industry and then give the formulation of these drugs. This approach enables a researcher to develop new drugs based on the provisions of GOST 30495-2006. Chemical means and methods of wood protection should be used when all constructional and structural possibilities of wood protection have been exhausted or are constructively impossible. Chemical protection of wood is achieved by coating or impregnating wood with chemical protection agents.

The use of wood preservatives always means the use of biocides, since when chemical protection is applied, organisms that attack and destroy wood are destroyed or scared away. Microorganisms are also used as such substances, including viruses and fungi of the corresponding action and purpose.

Wood preservatives are preparations that mainly consist of active substances (biocides), binders (for fixing), emulsifiers, pigments, solvents and other auxiliary substances. Chromium compounds in wood preservatives serve primarily to fix the active ingredients on the wood, thereby effectively reducing washout. There are many chemical treatments to protect wood. A distinction is made between deep processing - pressure impregnation and immersion (inclusion method) - and surface processing methods. When impregnated under pressure, full penetration of chemical protection agents into the sapwood of the wood is achieved (complete protection). With the immersion method (long-term immersion), the tree species must be completely submerged for a long period of time (from 24 hours to several days). The penetration depth must be greater than 10 mm, otherwise it is only edge protection. Depending on the type of wood, this method achieves a penetration depth of several microns to several millimeters. Most heartwoods are difficult to penetrate due to their anatomy. However, it is important that low-hardy sapwood is usually deeply permeable and thus protected.

Wood used in direct contact with the ground, such as a palisade (hedge), is a good illustration that early fungal attack can only be prevented by using naturally resistant tree species or by preventive chemical protection. This can be done in the usual way by pressure impregnation in a boiler. As a protection against blue stains in pine sapwood, the penetration depth must be greater than 1.5 mm (control according to EN 152). Therefore, when applying protective agents with a brush, it is impossible to achieve complete protection against fungi that attack wood. If the wood inside is always wet with a moisture content above 30%, then, despite the chemical protection of the wood (when protecting the surface) and the coating, the risk of rotting inside remains, especially with large cross-sections of wood. Most often, wood-destroying fungi become partially active only when the moisture content is significantly higher than the saturation state of the fibers<sup>5</sup>. Color-changing fungi (causing blue discoloration) do not attack resistant tree species such as pine sapwood with a moisture content above 18–20%.

The most important feature of chemical fire protection is that it reduces the thermal stability of the material in the area the temperature preceding combustion, and does not lead to its increase, as with fire protection based on physical phenomena. However, this decrease and change in the direction of wood decomposition inside of the formation of non-combustible products of thermal destruction turn out to be most beneficial for suppressing the subsequent burning.

The simplest method of fire retardant wood processing is impregnation with fire retardants, which can be surface and deep. According to the data, for translation wood into a flame-resistant material must be achieved wood absorption of fire retardant in terms of dry matter in the amount of 30-45 kg / m<sup>3</sup>, and for low-combustible material – 60–85 kg / m<sup>3</sup>, which achieved by deep flame retardant impregnation.

Surface fire-retardant impregnation of wood provides two types of treatment, namely: multiple application of flame retardant products to the surface without drying between intervals and with drying. In this case, the quality of impregnation is characterized by retention of a protective agent or is regulated by the cost impregnating agent.

Fire retardant impregnation of wood, carried out according to the method heating-cold bath or soaking a hot wood in a cold fire retardant solution, provides for penetration fire retardant to a depth of at least 3 mm for heavy impregnated areas and at least 5 mm - for easily impregnated areas. On the practice, three options are used for impregnating wood by the method applying protective agents to the surface. Impregnation can carried out by immersing the tree in an impregnating solution, applying the solution to the wood surface with a brush, and spraying with a spray gun. All three options simple, do not require special equipment or equipment for carrying out fire retardant works. However, with this method of impregnation the depth of penetration of fire retardants into the wood does not exceed 3 mm for lightly impregnated areas and 1 mm for heavily impregnated areas.

**Results and Discussion.** In these cases, an anti-blue remedy is rational, often combined with an anti-mold agent. In this case, we are not talking about the preventive chemical protection of wood in the meaning of DIN 68800-3. Moisture (dampness) protectors will also not be effective against insects. However, smooth and crack-free surfaces can interfere with egg-laying and thus insect reproduction and structural deterioration.

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