

Durability of varnishes - are subjective assessments enough?

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Abstract: This paper is based on a study of the protection performance of varnishes applied to a wooden substrate for outdoor exposure. The aim of the work was the evaluation of some of the test methods that are often used in the coating industry to determine the durability of coating systems: determination of film thickness, designation of quantity and size of defects, and of intensity of uniform changes in appearance; determination of specular gloss and colour measurement. The methods were applied to eight varnish systems (with and without colorants and light stabilizers) that were subjected to artificial weathering and to natural weathering in outdoor exposure. The test methods used, to evaluate the appearance and physical-chemical properties of the coating during its degradation, seem to be able to select the best varnish formulation to the protection of wood for exterior uses and gave also an idea about their usefulness.

Keywords: varnish, test methods, appearance, weathering, durability.

1. INTRODUCTION

Timber is an organic material used in construction and decoration capable of giving comfortable environments with high aesthetic value. Though, when it is used in the exterior it becomes exposed to atmospheric agents (mostly solar radiation and rain) that will degrade the coating surface giving it an old look. In these conditions, the changes in the wood superficial layer are due mainly to the break of lignin and of other constituents of wood by ultraviolet radiation, and its subsequent remove by the action of rain, associated with the loss of water soluble products. The extended exposure to atmospheric agents leads to the loss of the timber natural colour and to the accumulation of dirt and also to the eventual growth of fungi on the wood surface [1, 2].

Moreover, the repeated temperature and humidity variations of the ambient air will originate successive moist and drying cycles of wood, with the corresponding swelling and retraction, creating cracks more or less profound. These will in turn lead to the exposure of underneath layers to the atmospheric agents and to the progress of the process to the interior. Due to this reasons it becomes fundamental to protect the wood surface with appropriate products, in particular, when the timber is applied in the exterior and subjected to the weather [3].

Due to its complex structure, the knowledge of the anatomic constitution of this type of substrate becomes indispensable for the understanding of the techniques of preparation of wood (drying and eventual preservation) and for the choice and formulation of the appropriate superficial coating.

In a protected wood, the water exchanges with the exterior depend to a large extent on the permeability to the water vapour of the applied products. An important function of the covering is the control of the water exchanges that occur between the wood and the exterior, limiting the development of bending and cracks. The use of coatings with UV absorbers (that act as filters), also minimizes the degradation of the wood by the ultraviolet radiation [4]. The coatings can also play a role in the reduction of the risk of degradation of the wood by biological agents if they have added wood preservatives or if a convenient wood preservative is applied before coating.