Salt contamination of wooden materials: the case of Trondheim (Norway) warehouses

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ABSTRACT

Warehouses were big architectonical structures dated back between the 17th and the 20th century mostly made of spruce wood and utilized as storage buildings mainly by food traders [1] in Northern Countries. Trondheim's warehouses, lying on the solid pole foundations, were usually made as a combination of the wood frames and log structures allowing the creation of small and low rooms in the lower levels and very large and high spaces in the upper ones. The structures currently observable in Trondheim along the river Nidelva date back between the 17th and half of the 19th century since in 1845 the administration prohibited the use of wood for buildings in the city centre due to two huge fires that destroyed it.

These typical buildings are still present in cities developed starting from the Middle Age on the coasts of Scandinavia and of Norway in particular, whose economy was based on the export of stockfish (dried cod) toward the southern regions of Europe [1]. These big structures were principally used to stock and process fish, basically consisting in its salting or fermenting, while the drying process occurred on open air racks or cliff [1]. Therefore, where the food goods were stored, residuals are expected to be still present and/or to be responsible for the formation of alteration products on the wooden surfaces as well as inside the wooden structure.

Wood alteration phenomena driven by salts presence have been rarely studied in the field of the conservation of cultural heritage; the few available study concern Scandinavian structures, where wood has always been the most important building material and are related to the use of chemicals for preservative scopes [2].

Here we propose a characterization of residual and neo-formed salts by means of vacuum microbalance that allowed to individuate, as well, the maximum thickness of water film adsorbed on the wooden samples at 93% of RH. These data have been related to variations in the acoustic emission (AE) intensity monitored on the same structural elements analyzed with the micro-balance and to their moisture content measured trough a capacitive moisture meter. The application of three independent techniques have allowed obtaining interestingly information indicating their potentiality as characterizing methodologies in the field of historical materials and specifically in the study of salts weathering in particular on wood. Consequently, the proposed case study can represent a good starting point since obtained data evidenced that the capacitive moisture meter is not able to discriminate between surface and subsurface layer of deliquescence salts because the signal saturates after the first nanometer of water. On the contrary, AE resulted as being a very effective non-destructive technique to achieve information about the material state of conservation allowing detecting signals modifications due to superficial and sub-superficial layer of deliquescent salts.

REFERENCES

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