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Extended Abstract

Non-Invasive Treatment Based on Nanomaterials for Cultural Heritage Objects †

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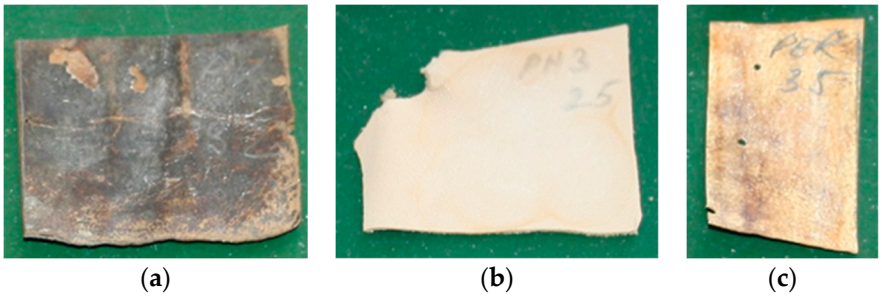
Cultural heritage objects suffer from different reasons for degradation, which are often irreversible. They represent the link between the past and the future, and it is our duty to protect them. Among different support materials, leather and paper are the most sensitive materials, due to their organic support, and improper storage conditions can lead to severe damage due to bacterial degradation.

In previous studies, our research group revealed the presence of several species, such as *Aspergillus* sp. (*Aspergillus clavatus* and *Aspergillus ochraceus*), *Penicillium* sp., *Fusarium* sp. (*Fusarium expansum* and *Fusarium flavum*), *Alternaria* sp. (*Alternaria rudis*) and *Rhisopus* sp. (*Rhizopus stolonifera*) on selected paper artefacts from the XIXth century [1]. This study demonstrated that even if at visual evaluation, the samples do not appear to be infested, they are damaged at the microscopical level by different bioteriogens. In this context, the necessity of safe treatment methods conducted us to the use of non-invasive treatments, based on nanomaterials, to protect the cultural heritage materials.

For this study, recipes based on synthesized nanostructures were developed in order to be used as pulverizable solutions for obtaining a protective antimicrobial layer. The solutions were tested for efficiency using old natural leather (from historical book covers), new natural leather (lamb, calf, and goat, tanned with vegetable tannins) and old parchment (sheep leather) (Figure 1).



(**a**) (**b**) (**c**)

Figure 1. Aspects of the samples treated with the proposed recipe: Old leather book cover (**a**); new leather (**b**); and parchment (**c**).

The tested nano-recipes showed good antimicrobial properties, accompanied by a slight discoloration of the treated materials, with no deposits of solids visible on the surface of the samples.

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References

1. Fierascu, I.; Avramescu, S.M.; Fierascu, R.C.; Ortan, A.; Vasilievici, G.; Cimpeanu, C.; Ditu, L.M. Micro-analytical and microbiological investigation of selected book papers from the nineteenth century. *J. Therm. Anal. Calorim* **2017**, *129*, 1377–1387.