

50 years' experience of gamma irradiation for remedial conservation of cultural heritage at ARC-Nucléart

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Gamma irradiation processing is used for remedial conservation since the 70's in ARC-Nucléart, Grenoble, France. It can arrest biological degradation and, when necessary, consolidate the most fragile artefacts using radio-curable resin. From that time, it has been continuously used on a very wide variety of artefacts.

Insect eradication is the most common treatment, 500 Gy being the threshold to reach the required deterministic effects leading to their systematic death. For fungicide purposes, doses up to 10 kGy reduce in statistical way the worst contamination to an acceptable level, the one that can be encountered in "healthy" museum or storage room. Potential side effects has always been considered with particular attention. Apart from some rare contraindications, experience has shown that the technique can be applied safely on a very large range of material.

For consolidation, densification of porous material with radio-curable consolidant is obtained after classical vacuum / pressure impregnation. Styrene / unsaturated-polyester resin is used, cross-linking being the way it hardens. The achieved consolidation is particularly efficient and stable, but irreversible. However, it is occasionally justified in some relevant cases.

These techniques continue to save many cultural heritage artefacts. From the last decade, international collaborations, notably through IAEA[1], help us to improve our understanding and control of side effects and to diversify our techniques. ARC-Nucléart, as a pioneer of these techniques, help also to their dissemination for a worldwide used.



Figure 1: Irradiation of polychrome wooden sculptures (Angels and Apostles, 17th c., Le Pègue, France) for insect eradication.

References

[1] - IAEA, Uses of ionizing radiation for tangible cultural heritage conservation. IAEA Radiation Technology Series N°6. International Atomic Energy Agency, Vienna (2017).