

## The effect of electron beam radiation on simulated fabrics used as a funeral shroud in Antiquity

*Tuesday, 14 June 2022 10:00 (20 minutes)*

With the development of radiation techniques, attempts were made to use both gamma radiation and electron beam radiation for the disinfection of various types of historical objects that were inhabited by microorganisms (e.g., fungi and bacteria) or insects, which ended up causing the objects' destruction. Natural fibres of plant and animal origin constitute the material of many valuable antique objects, works of art, and ethnographic exhibits. The use of ionizing radiation can be an effective and useful method for the disinfection of these objects. However, one should bear in mind that ionizing radiation has a destructive effect on many natural polymeric materials and may lead to deterioration in their mechanical, physical, and chemical properties. In this work Scoured, unbleached fabric was used as a simulation for the studied ancient shroud. The fabric was aged by heating at 100 °C for 72 h. The textile fabric was cut into 10 × 3 cm (length × width) warp test specimens. The experimental samples were infected with the selected species within the used media through a direct incubation period for 20 days in order to be infected with the species that may affect the ancient shroud. The effect of radiation on the mechanical properties and surface structure of woven fabrics made of fibres was investigated. It was found that small radiation doses (up to 15 kGy), sufficient for effective disinfection of textiles, caused only insignificant changes in the fibre parameters tested. However, it was found that doses increased to 50 kGy bring about a considerable weakening of the tested fabrics. Surface morphology of treated and untreated samples was investigated using a scanning electron microscope. Infrared spectra of irradiated samples before and after ageing by heat method were recorded. The results showed that there were slightly changes in the IR spectra of all irradiated samples compared with spectra of untreated sample. ESR studies showed that the radical formed by radiation decayed after short time and as the radiation dose increases, the amount of radical increases. In conclusion it is possible to use the electron beam for disinfection and preservation of texture used as funeral shroud in ancient Egypt with slight effects on their properties

**Primary authors:** ABDELREHIM, Hassan (Atomic Energy Authority of Egypt); Ms DEGHIEDY, Noha (NCRRT, Egypt)

**Presenter:** Ms DEGHIEDY, Noha (NCRRT, Egypt)

**Session Classification:** Poster session

**Track Classification:** Track 3: Safe analysis of heritage objects