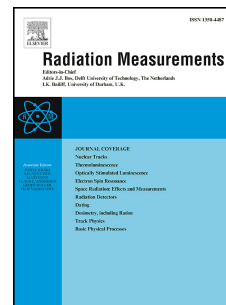


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An empirical model of the sunlight bleaching efficiency of brick surfaces

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Abstract

Thermoluminescence (TL) is widely used for brick dating to reconstruct the building chronology of urban complexes. It can be sometimes inconclusive, since TL assesses the firing period of bricks that can be reused in different structures, even several centuries later. This problem can be circumvented by using a dating technique which uses a resetting event different from the last heating of the material: an ideal candidate is OSL, exploiting the last exposure to sunlight of the brick surface, which resets the light sensitive electron traps until the surface is definitely shielded by mortar and superimposed bricks and this advanced application of the OSL technique (surface dating) has been successfully attempted on rocks, marble and stone artifacts, but not routinely on bricks.

A non-rapid decrease of surface signal as a consequence of a short exposure to light results in a limit of the applicability of surface dating technique. To quantify the optical bleaching in the brick surface layers, the material OSL after sunlight exposure has been checked. The dependence of OSL/IRSL on signal the penetration depth of sunlight and on the exposure time has been studied.

Subsamples were cut from the inner core of a XV century brick: the newly created surfaces, never exposed before, were put under daylight for different times (60 s - 1 year), and their residual OSL/IRSL signal was monitored as a function of both depth and exposure time. After one year of exposure, the first external layer (0-0.5 mm) resulted partially bleached with a 20% residual. It is observed that the models proposed so far to describe the luminescence depth profile in rocks are not applicable for the bricks. The use of a newly developed numerical model gives the possibility to evaluate the bleaching effectiveness of solar exposure for archaeological bricks.

Keyword

Surface dating, bricks, OSL, IRSL, light bleaching

Introduction

Nowadays, luminescence techniques are powerful tools to date archaeological ceramic materials and geological sediments. In particular, TL (Thermoluminescence) dating can be successfully applied to reconstruct the building chronology of urban complexes. However, it can be sometimes problematic, since this technique dates the firing in kiln of bricks and this information can be misleading in case of reuse, which can occur even several centuries later.

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