

EXPLORING LUMINESCENCE BEHAVIOUR OF CALCITIC
ARCHAEOLOGICAL FILL MATERIALS IN THE CONTEXT OF CHEMICAL AND
MINERALOGICAL COMPOSITION

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more calcite rich contexts. At COR and HQ there

was a tendency for sensitivity to be lower in

geological/substrate contexts (the richest in calcite).

Thus the samples OSL responses appear activated

in nature, particularly those from CII, which should

have suffered more severe weathering. A positive

relation between quartz OSL sensitivity and Zr

content was observed, though Zircon was not

identified (often associated with transport and

weathering processes), and also with Ba. Lack of a

relationship with Br and Sb indicated little

anthropogenic influence on quartz OSL sensitivity.

Th / U ranged between 3.0 and 5.4. Samples from

CII exhibited an increase in DR from the bottom

(CII4) to the top of the ditch with the decrease of

calcite content (Table 1). D decreased from bottom

to top, so the sequence of luminescence ages was in

stratigraphic order, but the values from the

lowermost samples indicated early Holocene age

and so predated archaeological expectations. HQ

samples, with lowest calcite content, had higher

DR values. Attending to D and DR obtained values,

the calculated ages for these samples were in the

expected time scale (Table 1). Conversely, COR

site samples displayed both the highest calcite

content, but slightly higher than expected DR

values and ages. A combination of dating and

Table 1. Quartz OSL sensitivity, sample calcite content, dose rate, dose rate, determinate dose and age.

Sample	T _N (±σ) ^{10³} (%)	Calcite (%)	DR (Gy/ka)	D (Gy)	Age (ka)
CIII	33±3	53	0,67	4,9	7,3
CII2	25±3	55	0,60	4,9	8,2
CII3	30±3	62	0,56	7,7	13,8
CII4	40±5	70	0,49	5,8	11,8
HQ1	6±1	35	0,86	4,4	5,1
HQ2	4±1	47	0,79	3,5	4,4
COR1	8±1	90	0,66	5,2	7,9
COR2	9±1	72	0,93	6,5	7,0

Introduction: In the frame of the impact studies

due to the irrigation network construction of the

Alqueva dam, negative archaeological structures

(Chalcolithic or Neolithic) in Baixo Alentejo

(Portugal) are being dated by luminescence

methods. These structures were initially excavated

in distinct poorly-consolidated geological

contexts of the Ossa Morena Zone and, after human

abandonment, stratified accumulation of materials

and artefacts occurred in these ditches. Calcite rich

contexts may contribute mineral grains with

residual luminescence signals and/or change dose

rates by precipitation/dissolution and alteration of

water retention properties. Three sites: Monte

Carascal (CII) in Miocene deposits overlying

gabbros of Beja, Horta dos Quarteiros (HQ) in

acid metavolcanic rocks of Moura-Ficalho antiform

and Cortes (COR) included in Miocene deposits of

Moura basin formation, are considered. HQ and

COR substrate accumulated as an alluvial fan in the

Miocene (detrital calcite) whereas CII substrate is

classed as calciche, indicating that it formed under

conditions of arid climate characterized by dry

season and occasional heavy rains (cycles of

CaCO₃ dissolution, mobilization and

reprecipitation). The main goal of the present work

is describe the luminescence and dosimetric

behaviour and its relationship with chemical and

mineralogical composition.

Experimental: Luminescence analyses of quartz

and polymneral fractions from profiling samples

were used to estimate the sensitivity of samples to

radiation and the absorbed doses (D), using IRSL,

OSL and TL signals. SAR-OSL analysis of 160-

250µm quartz grains was used for D determination

of dating samples. Geochemical studies, using in

situ gamma spectrometry, Instrumental Neutron

Activation Analysis (INAA) and X-Ray

Fluorescence (XRF) were used to determine trace,

minor and major elements and allow calculation of

dose rates (DR). X-Ray Diffraction (XRD) was

used to identify mineralogical composition.

Results and Discussion: Quartz OSL sensitivity

was highest at CII and was most elevated in the