

EJECTA FROM METEORITE IMPACT NEAR THE CENOMANIAN-TURONIAN BOUNDARY
FOUND AT NORTH OF NAZARÉ, PORTUGAL

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This report summarizes preliminary studies on the ejecta found (by one of us, A.R.) near the Cenomanian-Turonian boundary in a coastal site north of Nazaré (western-central Portugal). If this is the ejecta from a meteorite impact, as it is proposed here, it must be related to the Tore Sea-Mount impact crater [1], situated 300 km to the west of the studied ejecta site.

The ejecta is distributed in a small rectangular area of approximately 60 m × 10 m; it overlies a brecciated limestone of Cenomanian age, being covered by a several-meters-thick, very-poorly sorted, tempestite-like, Turonian and/or Senonian sandstone. The ejecta clasts show a homogeneous distribution along a narrow corridor that extends for 50 m with a general trend Nmg 60° E. The size of the clasts varies from millimetric up to 80 cm; each clastic boulder corresponds to a polymitic breccia comprising a variety of different lithologies. Their shape are diverse, but rounded, spherical, and ellipsoidal forms predominate. The ejecta clasts display dominant black to brownish-yellow colors, quite often with a greenish tinge. The most notorious macroscopic phases are iron sulfides, but other minerals such as quartz fragments and calcitic nodules are also visible in hand specimen. Optical (reflected and transmitted light) and SEM-EDX analyses indicate the occurrence of pyrite, two unidentified iron oxides, quartz, calcite, and devitrified glass; however, in contrast with the intersample mineralogical monotonous composition, several different textures were observed.

One of the major components of the silicate phase is diaplectic glass; this glass can be found in the breccia matrix and as a major fraction within recrystallized quartz fragments making up to 40% modal of the ejecta samples. The diaplectic glass fragments have a brown color and characteristically they are surrounded by dark halos.

Quartz shocked crystals are very common and a few grains also display optical features suggesting an internal organization into “planar elements.” Small inclusions of a SiO₂ phase also occur within diaplectic glasses; these inclusions are characterized by higher refractive index than the surrounding glass and closely resemble the cryptocrystalline coesite occurrence from the Coconino Sandstone at Meteor Crater [2].

Impact melt features were also observed being dominated by trachytic type (microlite) textures; however, felsitic (cryptocrystalline) textures are also present. The actual microlites are now composed of quartz and calcite, but they could represent pseudomorphs after previous mineral phase(s).

In spite of the lack of knowledge that still exists on the detailed stratigraphy, it is certain that the ejecta material was deposited close to the Cenomanian-Turonian boundary, at about 91 m.y. Significantly, the Nazaré phenomena coincides with a well known stepwise extinction [3] and with a global Ir anomaly [4].

Acknowledgment: This work was funded by a JNICT grant PRAXIS XXI/BD/9542/96 to José Monteiro.

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