MICROSCOPIC EVIDENCE OF SHOCK METAMORPHISM EFFECTS IN DETRITAL MINERALS FROM THE COLÔNIA CRATER SEDIMENTS, SP

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RESUMO: The 3.6 km-diameter Colônia Crater, centred at 23O52'03" S and 46O42'27" W, displays a steeper inner slope near the top of the rim that decreases gently toward the crater's centre, similar to many other simple impact structures. Siliciclastic sediments, very-poorly sorted, with some intercalations of thin layers of organo-pelitic material, are the main variations of the crater-fill deposit.The first report of a possible impact structure in the Colônia region was in 1961 [1]. Since, although no convincing evidence was found, many studies proposed an impact cratering origin [2, 3, 4]. In recent years, two boreholes were drilled inside the crater for groundwater exploration. The drillings reached a depth of 142 and 197 m, allowing to collect 170 samples. The entire geologic cross-section consists mostly of a thick sequence of terrigenous sediments and fragments of altered basement rocks. This work has the purpose of documenting, for the first time, some representative optical properties of shock microdeformations in detrital minerals.The mineralogic characterisation was performed on a set of 60 samples, selected from different depths, using a conventional petrographic microscope. The most common detrital minerals are quartz, K-feldspar, muscovite, tourmaline and clay minerals. Other smaller constituents include zircon, epidote, biotite, corundum, plagioclase, apatite, anatase, and rutile, as well as lithic fragments of igneous and metamorphic rocks. Excepting the zircon, apatite and rutile, all the other minerals occur as xenomorphic grains and present a wide granulometric variation (0.05-1.7 mm).Closer examination of the individual grains of quartz, K-feldspar, muscovite and zircon reveals a series of unusual optical proprieties. These distinctive features include: i) anomalous refractive index, ii) marked decrease of birefringence, iii) subdomains of crystal misorientation, iv) intense intragranular microfractures, v) grain mosaicism, vi) ladder texture, vii) kink-banding, viii) planar fractures and ix) planar microdeformation features. These microstructures are consistent with a specific microcracking caused by the passage of high-pressure shock waves during a hypervelocity impact [5,6,7].The petrographic evidence presented here clearly indicates that the Colônia Crater is a geological structure formed by hypervelocity impact. Despite the discovery to be important, some issues related to the shock metamorphism conditions (P-T parameters) during the impact remain unresolved. An accurate determination of the refractive index, density, degree of mosaicism and PDF crystallographic orientation, in quartz and K-feldspar crystals, is necessary for answering those questions.Acknowledgement:This research was supported by FAPESP foundation, Proc. 06/59046-6.References:1- Kollert et al., 1961. Boletim da Sociedade Brasileira de Geologia, 10:57-77.2- Motta, U.S. & Flexor, J.-M. 1991. In: Congr. Inter. Soc. Bras. Geof., Salvador, BA, v.1, p.140-142.3- Neves F. A. 1998. Revista Brasileira de Geociências, 28:3-10.4- Riccomini et al., 2005. In: http://www.unb.br/ig/sigep/sitio116/sitio116.pdf.5- Grieve et al., 1996. Meteoritics & Planetary Science, 31:6-356- Langenhort, F., 2002. Bulletin of the Czech Geological Survey, 77:265-282.7- French, M.B. & Koeberl, C. 2010. Earth-Science Reviews, 98: 123-170.

PALAVRAS-CHAVE: COLÔNIA CRATER; HYPERVELOCITY IMPACT; SHOCK METAMORPHISM.