TIN BIDER IMPACT STRUCTURE (ALGERIA): SHOCK METAMORPHISM IN ALBIAN SANDSTONES.

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Introduction: The Tin Bider impact structure, centered at 27°36' N and 05°07' E, is 6 km in diameter, and is the largest complex impact crater known in Algeria. It excavates sedimentary rocks, mainly Albian sandstones and Upper Senonian limestones. The age of the impact event is constrained to <65 Ma by stratigraphy, the youngest formation affected by the impact being ~65 Myr old limestones. The complex structure of Tin Bider is characterized by a central uplift where sandstones are exposed [1]. A few shocked quartz grains (i.e., with "planar elements") were described by Lambert et al. [1] but no detailed information on their nature (i.e., it is not clear if they are planar fractures (PFs) or planar deformation features (PDFs)) and orientations is presented (i.e., a few orientations are reported in a table in [1] but it is not clear if they were properly indexed or if only the angular relation to the c-axis was used), and the microphotographs are also not very convincing.

We report here on petrographic investigations of a few sandstone samples from the central uplift in which we were able to characterize shock metamorphic features in quartz grains.

Methods: A total of 11 polished thin sections were prepared and carefully searched for shock metamorphic features in quartz grains, such as PDFs, using an optical microscope. Considering the rarity of the grains showing PDFs, they were systematically marked (using a marker pen directly on the section) to be able to easily find them again under the Universal stage (U-stage). The crystallographic orientations of PDFs in quartz grains [e.g., 2, 3] were measured using a four-axis U-stage [e.g., 4, 5] at the Department of Lithospheric Research, University of Vienna. PDFs were indexed by hand using the new version of the stereographic projection template (NSPT) by Ferrière et al. [6].

Results and Discussion: Optical microscope investigations show that most quartz grains do not exhibit obvious shock features even most of the grains show undulose extinction. Rare grains with PDFs were detected during our survey, with only 1 or 2 sets (as seen under the U-stage). PDFs are mostly decorated with fluid inclusions indicating that the originally amorphous material in PDFs was recrystallized and that this recrystallization was water-assisted [2, 3, 7]. The investigated PDFs are mainly oriented parallel to $\pi\{10\bar{1}2\}$ and $\omega\{10\bar{1}3\}$, but also to $\xi\{11\bar{2}2\}$ and $x\{5\bar{1}\bar{6}1\}$, all typical PDFs orientations [e.g., 2, 6]. Planes parallel to the $r\{10\bar{1}1\}$, $m\{10\bar{1}0\}$, $s\{11\bar{2}1\}$, and $a\{10\bar{1}4\}$ orientations also occur but in lower proportions. A few quartz grains with one set of PDFs are oriented parallel to c(0001), corresponding to mechanical Brazil twins [8]. No PFs, neither feather features, were detected in the investigated thin sections. Also, no diaplectic glass or melted grains were detected during our investigations.

Conclusion: We report here for the first time on the occurrence of PDFs oriented parallel to c(0001), corresponding to Brazil twins, in samples from Tin Bider. The extremely low abundance of PDFs in quartz in the investigated samples is possibly due to the erosion of the structure. Additional samples will be collected and investigated to confirm the preliminary observations presented here and to constrain shock pressures recorded by samples outcropping at the central uplift of the Tin Bider structure.

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