A SURVEY OF ZIRCON MICROTEXTURES IN THE ROCHECHOUART IMPACTITES

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Introduction: The Rochechouart impact structure recently dated at 207 Ma [1], is emplaced in a granitic-gneissic crystalline basement at the western margin of the Hercynian Massif Central in France. Impact deposits are still preserved in a 12 km zone, filling the central depression of an eroded complex crater interpreted as a peak ring structure that initially reached 50 km in diameter or more [2]. It contains a variety of impactites ranging from lithic breccias to melt-bearing breccias and coherent melts [3,4] and has lately been the target of an international scientific drilling campaign under the scope of the *Center for international Research and Restitution on Impacts and on Rochechouart* (CIRIR) [5]. This ongoing study is part of the CIRIR team effort and has focussed on the survey of zircon microtextures in various impact lithologies from Rochechouart.

Samples and Methods: Impactite surface samples – ranging from lithic breccias to coherent melt – were collected at seven localities within the Rochechouart impact structure, and an unshocked gneiss was sampled below the crater floor. From these samples, thin sections were manufactured, and zircon was separated via conventional Wilfley-table techniques. For each investigated rough sample, grains were divided into either translucid or stained, based on their appearance under binocular microscope. So far, SEM-BSE studies have been made on rough surface zircon separates from four lithologies: (i) unshocked gneiss from Moulin la Brousse used as a control sample, (ii) a clast of shocked gneiss included in melt bearing breccia from Puy de Chiraud, (iii) melt-bearing impact breccia from Chassenon, and (iv) impact-melt from Babaudus. Also, zircons in three Chassenon (iii) thin sections have been studied under SEM-BSE.

Result: All impactites (ii-iv) display shock features under petrographic microscope e.g. planar deformation features (PDFs), ballen- and mosaicism texture in quartz, whereas the 'control sample' (i) displays no shocked features, and will be utilized as a guideline for comparing unshocked- and shocked zircons. Zircons separates in the unshocked gneiss are mainly subhedral with sizes ranging from c. 60-150 µm. The stained populations have more rugged surfaces which may be remnant imprints from accessory phases e.g. apatite. No impact-related textures are distinguishable. Contrarily, the shocked gneiss generally displays a variety of textures, distinguished as impact signatures. Grains are mainly subhedral and ovoid, with sizes ranging from c. 50-160 µm. Both the translucid- and stained populations have similar textural characteristics but are more distinct in the latter: Single- or traversed curviplanar to planar fractures (PFs), oriented c. 40°-90° and/or c. 120° perpendicular to the c-axis. Granularization occurs at various degrees, commonly propagating from structural weaknesses i.e. PFs and lattice termination. In rough surface imagery, only a few grains in the stained population from the melt-bearing impact breccia (iii) exhibits faint traversed PFs. Grains have ovoid and oblong irregular shapes, with sizes between c. 50-120 µm. Their appearances are similar to the stained zircons from the unshocked gneiss. However, in thin section imagery, zircons affiliated with lithic clast are euhedral with sharp crystal boundaries or with shattered irregular shapes, both display well-defined to faint PFs. Further, skeletal zircons with spongey textures and granular zircons occurs in association with the groundmass i.e. impact melt. The Babaudus zircons (iv) have sizes ranging from c. 50-230 µm, with mainly subhedral and oblong morphologies. All grains in the stained population displays granular textures i.e. the crystals surface are entirely covered by a myriad of disorderly arranged cryptocrystalline aggregates, consisting of neoblastic zircon crystallites (<1-2 µm). About 40% of these zircons are to various degrees encased within a quartzofeldspathic microcrystalline mass, similar to the Babaudus groundmass. The translucid population is scarce in comparison, lacks granular texture, and overall has a smooth but rugged surface. Rough surface features on one grain consist of needle-shaped (acicular) ornaments, which can either resemble angular- or irregular lattice engravings.

Future work: The granular zircons in Chassenon (iii) and Babaudus (iv) will be the focus of future electron backscatter diffraction (EBSD) analyses to distinguish whether they are so called FRIGN (former reidite in granular neoblastic) zircons [6]. It is important to determine the behaviour and response to shock in zircon since this mineral is a candidate for impact age determination via the U-Pb system, e.g. see recent work on shocked zircons in the Babaudus melt from Rochechouart [7].

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