REIDITE DISCOVERED IN THE TRIASSIC DISTAL IMPACT EJECTA DEPOSIT OF SOUTHWEST BRITAIN

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Introduction: Impact ejecta deposits are important for studying impact events as exemplified by the globally distributed K/Pg boundary layer. Ejecta layers are however elusive and only 46 deposits have been confirmed to-date [1]. One of these impact ejecta deposit is located within the Wickwar quarry *c.* 10 km Northeast of Bristol in Southwest Britain. The Wickwar impact ejecta layer defines a 0–150 mm thick unconformable boundary between the Carboniferous *Clifton Down* limestone and the Triassic continental red *Mercia* mudstone (i.e. the *Keuper Marl*). The deposit contains *c.* 1 mm sized, mainly rounded, spherules that have been devitrified to clay and/or replaced by calcite during post-depositional diagenesis [2,3]. An impact origin for the layer was firmly established by Walkden et al. [2] and Kirkham [3] based on the discovery of shocked quartz. An $^{40}Ar/^{39}Ar$ date of authigenic K-feldspar from the layer yielded a plateau age of 214.0 ± 2.5 Ma. This age estimate overlaps or is in close correlation with several near-by Late-Triassic impact structures in the northern hemisphere (i.e. the ~40 km wide Lake Saint Martin, the ~9 km wide Red Wing, the 25 km wide Rochechouart, and the ~85 km wide Manicouagan) [2]. A heavy mineral provenance study utilized garnet geochemistry to pinpoint the 214 ± 1 Ma Manicouagan impact structure in Canada as the most likely source crater [4]. During the time of the impact event, materials were thus transported and deposited *c.* 2000 km—or at a distance of *c.* 24 crater diameters—away from the crater. The layer hence represents one of the few distal impact ejecta deposits with a known source crater. However, little is known about the deposit, and to date only three studies have investigated material from this layer [2,3,4]. Despite effort, no shock features in zircon have yet been reported [4].

In this abstract, we present preliminary results from an ongoing heavy mineral survey, focused on zircon, which so far comprises scanning electron microscopy (SEM) imagery and microstrucutral electron backscattered diffraction (EBSD) analysis. Here we present the discovery of the rare mineral reidite, a high-pressure polymorph of zircon, within the Wickwar impact ejecta deposit.

Materials and methods: Zircon separation, sample preparation, SEM-settings, and collection and post-processing of EBSD-data followed the analytical protocol of Plan et al. [5]. Zircon grains from thin sections and heavy mineral separates from the ejecta layer have been surveyed. So far, one zircon grain of interest has undergone EBSD-analysis.

Preliminary results and discussion: Thackrey et al. [4] reported primarily rounded zircon grains interpreted to indicate a detrital origin. However, a majority of the zircon grains surveyed in this study are elongated and euhedral with well-developed crystal faces with sub-rounded terminations. The length of crystals range from *c.* 60 to *c.* 120 µm. Internally, the dominant feature consists of oscillatory zonation patterns with various cathodoluminescence (CL) responses. Based on these characteristics, the zircon grains are interpreted to be of igneous origin. Shock-induced features have been found in < 10 % of the examined zircon grains whilst Thackrey et al. [4] found no shock features in their study. The morphology and shapes of the shocked zircons identified here vary from elongated and subhedral to irregular and anhedral, with lengths ranging from *c.* 15 to *c.* 80 µm. A distinct shock feature is consecutive planar fractures (PF) that propagate in either one or two orientations. Some PFs correlate with lamellae that have relatively BSE-brighter signal intensities and with darker CL-response compared to the zircon matrix. One *c.* 35 µm sized grain that was analyzed with EBSD is highly deformed and irregularly shaped. This grain exhibits irregular fractures and microcataclastic-like domains internally. Two sets of PFs that correlate with BSE-bright lamellae are identified. Based on EBSD match indexing, the lamellae are composed of reidite. The orientation relationship between the host zircon and the reidite lamella is characterized by the alignments of a $\{100\}_{zircon}$ to a $\{112\}_{reidite}$, and a $\{112\}_{zircon}$ to a $\{112\}_{reidite}$, the crystallographic systematics is consistent with previous observations of reidite lamellae [e.g. 5, 6]. Our study comprises the first characterization of shock-induced features in zircon and reidite from the Wickwar ejecta layer. This discovery shows that the distribution potential of reidite during impact events may be greater than previously observed [e.g. 7]—up to *c.* 24 crater radius away from the crater rim. Our study further emphasizes the importance of including zircon microstructural studies when investigating shocked, or suspected shock metamorphosed, materials both *in situ* and *ex situ*—as zircon can provide diagnostic evidence of impact cratering (e.g. in forms of reidite).

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