

Artifact-in-impactite: a new kind of impact rock. Evidence from the Chiemgau meteorite impact in southeast Germany

B. Rappenglück¹, M. Hiltl², K. Ernstson³

¹Institute for Interdisciplinary Studies, D-82205 Gilching, Germany; *b.rappenglueck@infis.org*

²Carl Zeiss Microscopy GmbH, D-73447 Oberkochen; *mhiltl@online.de*

³University of Würzburg, 97074 Würzburg, Germany; *kernstson@ernstson.de*

Introduction

The Chiemgau impact (Fig. 1) as a meanwhile established Holocene impact event has featured quite a few exceptional observations in the last 15 years, which are summarized in [1, and references therein]. From the beginning of research it was clear that a huge catastrophe in the Bronze Age or Celtic era must have already affected densely populated regions, and in a routine archeological excavation at Lake Chiemsee the worldwide unique constellation was encountered that an impact ca-

tastrophe layer was excavated sandwiched between settlement layers of the Stone Age/Bronze Age and the Roman Period (Fig. 1, 2) [2]. Among the finds of ceramics, stone tools, bones and metal artefacts also featured externally rather unsightly lumps, which were found by use of metal detectors and were addressed as «slag» by the excavator. Here we report on specifically conducted mineralogical-geochemical investigations on 16 «slag» samples which have led to very remarkable results.

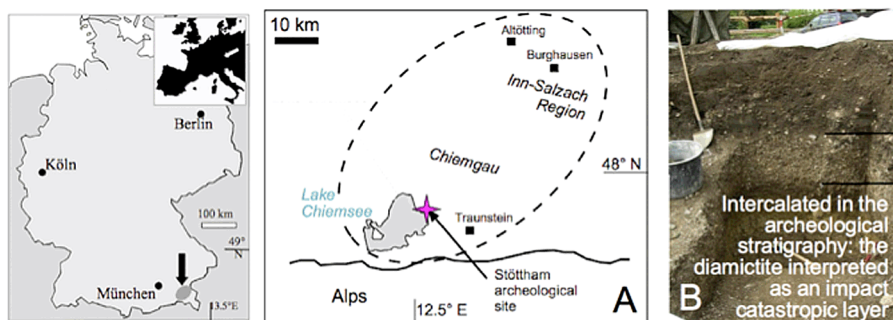


Fig. 1. Location map for the Stöttham archeological excavation (B) in the Chiemgau impact crater strewn field



Fig. 2. Inventory of the Stöttham archeological site (from left to right): diamictite of the catastrophic layer; archeological finds; carbon, metallic and glass spherules; strongly corroded and fractured cobbles, metal-rich «slag»

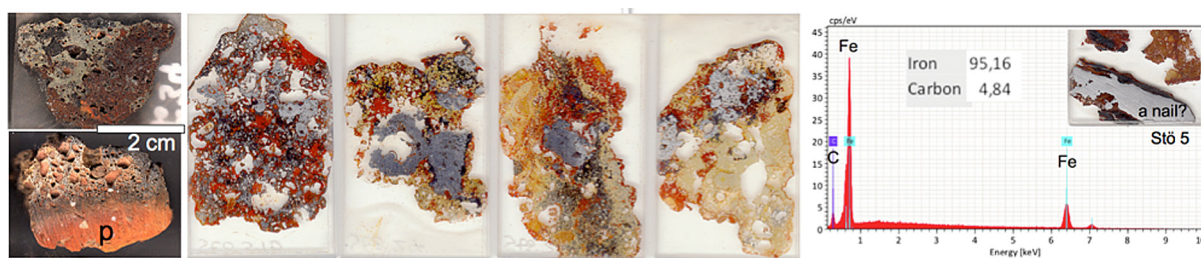


Fig. 3. Cut faces (to the left) and scanned images of corresponding thin sections accenting the shredded iron metallic particles as parts of the polymictic impact breccia. p = pottery shard merging into vesicular fusion. Rightmost: EDS spectrum of an iron particle (a nail fragment?). Apart from a little carbon Fe is the only element

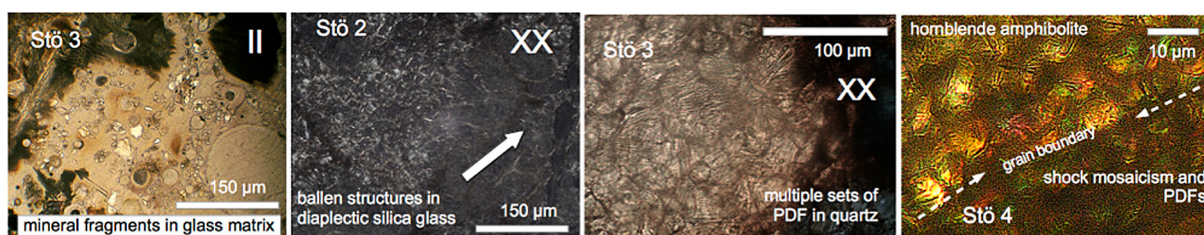


Fig. 4. Shock metamorphism in polymictic «slag» breccias. Photomicrographs

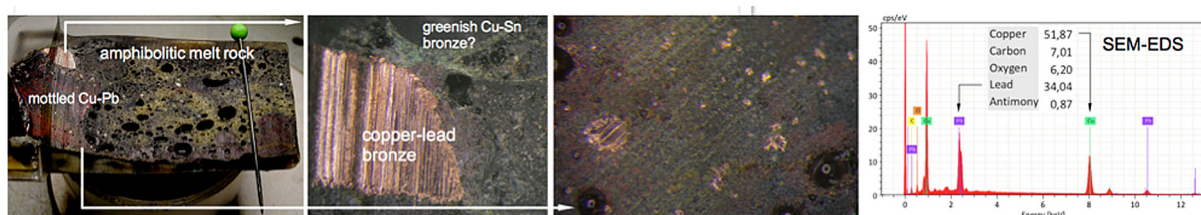


Fig. 5. «Slag» containing high leaded bronze fragments and mottled matter, and possibly Sn bronze

Material and analyses

On preparation of the «slags» by cutting and thin-section analyses with the polarizing microscope (Fig. 2), the «slags» turned out to be polymictic breccias with all signs of an impact melt rock with vesicular remnants of alpine Quaternary cobbles of the region mixed with multicolored rock fragments and abundant glass (Fig. 3). As a noticeable portion, partially shredded metal particles interpenetrate the breccia, which the metal detector had obviously classified as slag (Fig. 3). As already demonstrated earlier in the diamicrite of the catastrophe layer [2], the «slag» breccias contain abundant shock effects, here with greater density and intensity (Fig. 4).

The most remarkable observation in the «slag» proved to be bronze fragments, which according to SEM-EDS analyses are an unusual high leaded bronze (Fig. 5), which according to EDS penetrates the breccia also in fine and finest particles (Fig. 5). In addition to probable normal tin bronze (Fig. 5), iron particles (Fig. 3) are particularly noticeable, which

according to EDS consist only of iron without any other element apart from very little carbon (Fig. 3), a composition indicating iron in some processed condition.

Conclusions

The new investigations demonstrate once more impressively that the Stötttham archeological site had been involved in a meteorite impact event, the Chiemgau impact. The original finding of a meteorite impact layer between two archeological horizons was to be classified as unique worldwide. From the point of view of both archeology and impact research, the new analyses have put the crown on it by revealing human objects and impact shock intimately intertwined in the same samples — a worldwide novelty defining an artifact-in-impactite as a new kind of impact rock. A more exact dating of the Chiemgau impact, based on the metallic components, is a significant side effect of these unusual samples

and their investigation, scheduling the impact event between 900 and 600 BC [3].

References

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