THE BAUXITE OCCURRENCE OF RUSSBACH-ALMWEG NEAR STROBL, UPPER AUSTRIA

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This paper is dedicated to Anton W. Ruttner (*19. 6. 1911 in Eger, Bohemia)

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ABSTRACT/ ZUSAMMENFASSUNG

An occurrence of dark red solid bauxites of oolithic/intraclastic packstone/wackestone texture is exposed about 4 km NE of Strobl. X-ray diffraction analysis shows boehmite and hematite as predominant minerals of this Rußbach-Almweg bauxite, which is typical for bauxites deposited on the basis of the Gosau Group of sediments. Concerning its stratigraphical position a pre-Mid-Turonian age has to be assumed.

Das Vorkommen von dunkelrotem oolithischen und Intraklasten-führenden Bauxit von Rußbach-Almweg, etwa 4 km nordöstlich von Strobl entspricht lithologisch den bekannten kalkalpinen Bauxit-Vorkommen an der Basis der Gosau-Gruppe. Die Hauptmineralphasen sind Böhmit und Hämatit. Da das Einsetzen der marinen Sedimentation in der Gosau-Gruppe an mehreren Lokalitäten des Salzkammergutes im Mittel-Turon nachgewiesen wurde, muss für die Bildung der Bauxite ein Alter älter als Mittel-Turon angenommen werden.

I. INTRODUCTION

The small uneconomic bauxite occurrence Rußbach-Almweg has been detected in the year 1948 and subsequently briefly described by Schadler (1950). It is located about 4 km NE of Strobl. The Almweg forest trail can be reached by car on the road from Rußbach to Lake Schwarzensee. It branches off about 350 m from the Schwarzensee parking lot towards the south, shortly before reaching the Kuchler Sattel. The Almweg has to be followed by a hike for about 300m in southern direction. The bauxite is exposed directly on the Almweg forest road in a 20 cm thick and about 3 m long outcrop and several more scattered outcrops up to more than 1,5 m in thickness occur in the forest downhill east of the Almweg in an area of about 3000 m² towards a plain swampy glade (called "Lienbacher Mahd"), which is probably underlain by impermeable rocks (maybe also by bauxite?).

Unfortunately the contact of the bauxite with the underlying rocks is not exposed and the same is true for the hanging wall. In the existing geological maps (Leischner 1960, Plöchinger 1982) the bauxite exposure is not recorded and the area is mapped as Plassenkalk of Upper Jurassic age. In fact the surrounding Plassenkalk macroscopically is unfossiliferous and shows a recrystallized texture. In addition, the exposures of Plassenkalk are strongly corroded and karstified. Evidently the bauxite exposure is bound to a tectonized area. From a regional point of view the bauxite occurrence Rußbach-Almweg is situated in-between the well studied and previously mined bauxite occurrences on the foothills of Mt. Untersberg south of Salzburg (Günther, Tichy 1978, Leiss 1989, Mindszenty, D´Argenio, Bognár 1987) and of Weißwasser-Unterlaussa east of river Enns in Lower Austria (Haberfelner 1951; Ruttner, Woletz 1957; Mindszenty, d´Argenio 1987).

II. MINERALOGY AND THIN-SECTION DESCRIPTION

The **x-ray diffraction** analysis shows boehmite and hematite as predominant minerals of the Rußbach bauxite, while plagioclase and most likely kaolinite can be detected only in moderate amounts.

Notwithstanding the highly developed oolithic texture, in the **thin-sections** (Table 1) no macrocrystalline boehmite or gibbsite was detected either in the oolites or in the pores of the matrix. Seemingly all the boehmite grains, identified by X-ray, are of submicroscopic size. Extraclasts are represented by very rare silt-size grains of only ultra-stable minerals scattered in the matrix, namely by blue tourmaline and well-rounded zircon.

Texture: deep red oolithic/intraclastic packstone/wackestone. The matrix is of microclastic fabric. Embedded in it there are accretionary oolites, roundgrains, Fe-rich intraclasts, fragments of larger Fe-rich, septaria-like roundgrains. Around almost all of these roundgrains there are faint concentric to subconcentric orange-coloured laminae which gradually fade towards the enclosing matrix. The texture obviously implies in situ textural development of both oolites and encrusted roundgrains (the transition from the cortex of the oolites towards the matrix is almost always gradual). This in situ development was preceeded by parautochtonous transport (intraclasts, micro-pebbles).

Compaction: signs of compaction are inhomogeneous: at places primitive oolites and roundgrains show point-contacts or even line-contacts (between slightly deformed grains showing the effects of soft-grain deformation). In some instances, more mature Fe-rich oolites are sheared and displaced suggesting that more consolidated grains have responded by rigid deformation to the probably loading-induced stress which had no obvious effect on the still soft matrix. All these arguments suggest early compaction and therefore probably, at least episodically, high rate of sediment accumulation.

Geochemical facies: oxidative; hematite as predominant iron-mineral; no signs of pyrite, siderite or the oxidation products thereof.

All the textural features imply considerable in situ bauxitization, i.e. even though the pre-bauxitic material may have originally developed in a nearby lateritic terrain and deposited on the karstic carbonate surface after some transport, its **final bauxitization was certainly an *in situ* process**.

III. GEOCHEMISTRY

Schadler (1950) reports a chemical analysis of the Rußbach bauxite, showing SiO^2 8,01%, TiO^2 2,50%, Al^2O^3 51,71% and Fe^2O^3 20,91%. So far we do not have additional chemical data of the Rußbach-Almweg bauxite. M=6,4 (low-grade, iron-rich bauxite). The rather high percentage of alumina seems to be in full accordance with the considerable textural maturity observed in the thin-sections.

IV. DISCUSSION AND CONCLUSIONS

All the bauxites of the Northern Calcareous Alps, which occur on the basis of the Gosau Group of sediments were formed before the onset of the Gosau Group sedimentary cycle. Brick red or dark purple ferralitic/bauxitic marls often form the matrix of the Kreuzgraben Formation, which was previously called „Gosau-Basisschichten". The excellent exposures of these red ferralitic marls were studied by Leiss (1989) also in the Färbergraben NE of Gosau, where they fill a palaeorelief. This red marly part of the Kreuzgraben Formation constitutes partly cross-bedded alluvial mud flow fan deposits of transported ferralitic soils, which also show allochthonous material, such as feldspar grains. Leiss assumes that the feldspars were derived from weathered pyroclastic pebbles of reworked Upper Permian Haselgebirge.
By its texture and geochemical facies the Rußbach-Almweg bauxite is very similar to the pre-Santonian bauxite of Iharkút/Hungary or to the bauxite of the Untersberg area south of Salzburg. Günther and Tichy (1978) assume a Santonian age for the latter bauxite, which is underlying the "Untersberger Marmor". From several macro- and micropalaeontological studies of various Gosau occurrences we know that in the Salzkammergut region the marine sedimentation started already in the Middle Turonian. Therefore, we assume that the bauxite formation took place before the onset of the marine Gosau Group sedimentation, i.e. pre-Turonian.
Supposedly the depositional environment was highly oxidizing, vadose (thoroughly red colour), very possibly a **deep-sinkhole fill** (early compaction!) in a high-karst area (well above the karstwater-table).

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APPENDIX I: TABLE I

Scale: All photos were made with the same magnification. The longer side of the slides is equivalent to about 3850 micrometers, i.e. 3,8 mm. That means that the average ooid is of 600 micrometer diameter, smaller ones are ca. 200 micrometer, larger ones 1000-1200 micrometer, sometimes (like on russbachbx12, even larger: up to 2 mm!).

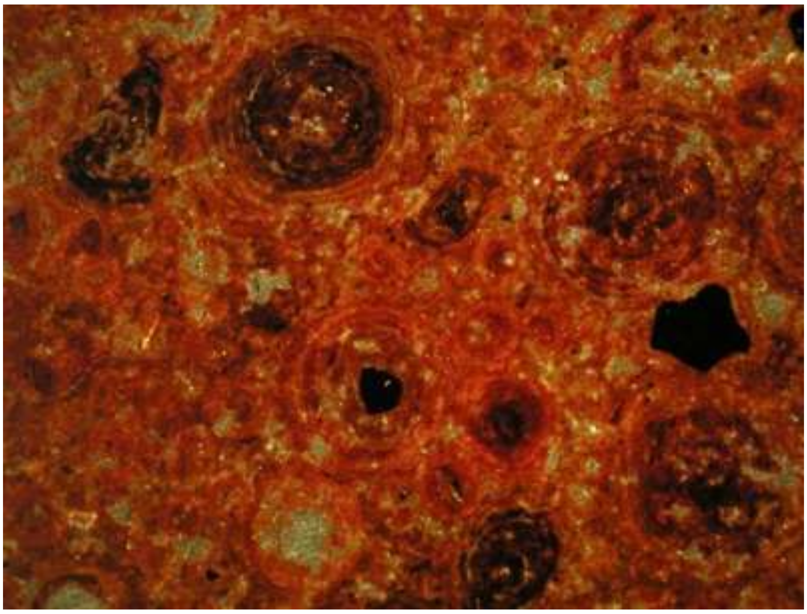

Fig. 1: Oolitic/intraclastic packstone texture indicative of intense parautochtonous transport on the karstic surface. Note that the accretionary crusts around most of the ooids fade gradually towards the enclosing matrix which implies that in situ textural development was significant. The overall deep red colour of the material clearly shows that deposition and early diagenesis took place under thoroughly oxidizing conditions (perfect drainage!)

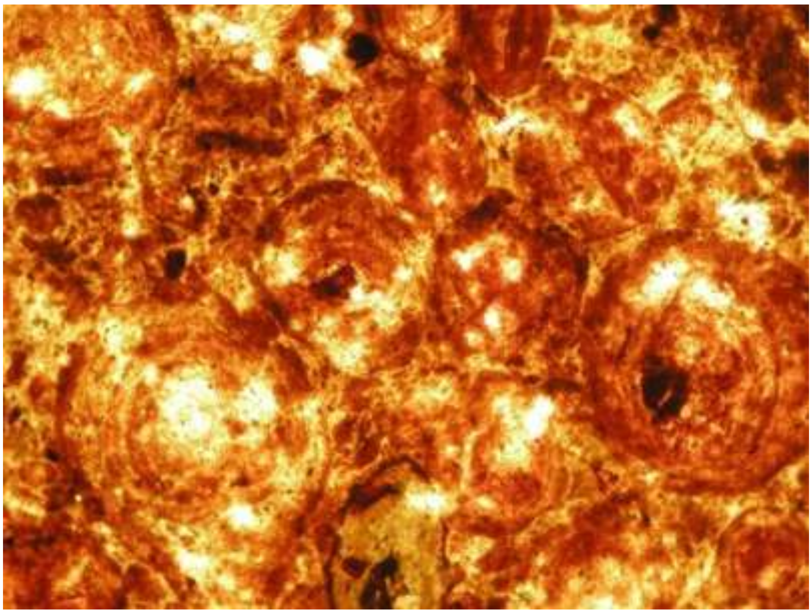

Fig. 2: Line contact and concave-convex contact of primitive ooids suggesting early, compaction-related deformation of the still soft grains – a sign of high rate of accumulation of bauxite in the karstic sinkhole, where under its own load the sediment has begun to compact well before the deposition of the non-bauxitic cover.

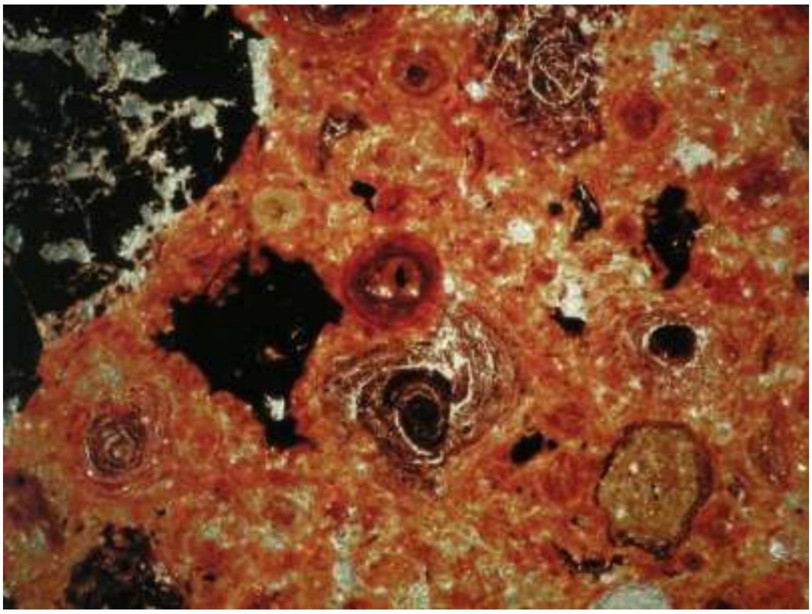

Fig. 3: Shear-plane cutting “older”ooid into two. Note that the deformation has affected only the ooid, suggesting that at the time of this rigid deformation of the ooid the enclosing matrix must have been still soft, i.e. shear was clearly related to early compaction.

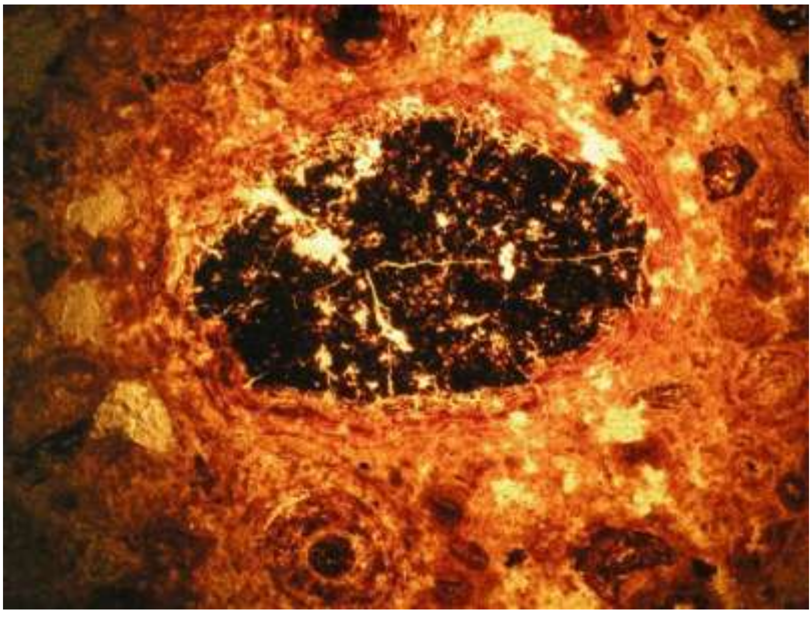

Fig. 4: Large hematite-rich intraclast surrounded by in situ developed Fe-rich accretion rims. Minor shear of core and cortex, obviously having developed after the core was encrusted, is visible at bottom right. Texture indicative of intense parautochtonous transport combined with efficient in situ textural development.