CALCIUM-ALUMINUM-RICH INCLUSIONS (CAIs) IN IRON SILICIDE (XIFENGITE, GUPEIITE, HAPKEITE) MATTER: EVIDENCE OF A COSMIC ORIGIN

Abstract

The iron silicides from the Chiemgau impact strewn field contain CAIs with minerals CaAl\textsubscript{2}O\textsubscript{4}, calcium monoaluminate, and CaAl\textsubscript{5}O\textsubscript{7}, di calcium aluminate. The monolitic high-temperature (~1500°C), low-pressure dimorph of CaAl\textsubscript{2}O\textsubscript{4}, the calcium aluminates, was first identified in a CAI from the GSh chondrite N470-41 and later reported [18, 19] to exist in a CAI in the carbonaceous chondrite meteorite NWA 1934. The single crystal CaAl\textsubscript{2}O\textsubscript{4} di calcium aluminate high pressure phase with the brownmillerite-type structure was established in 2000 [20] and has so far no natural counterpart. Experimental data were 1250°C and 2.5 GPa, and stability was reached between 4 and 9 GPa and at 1.50 K.

Introduction

Iron silicides have been playing a major role in the discovery and discussion of the Holocene large Chiemgau meteorite impact event [1-15]. They were detected by local history researchers in the Alpine Foreland (South-Eastern Germany, Fig. 1) in the subsolo down to the substratum. The iron silicides proved to be Fe3Si, mineral gupeiite, and FeSi3, mineral xifengite. The iron silicides regularly occurred near rimmed craters. Early conclusion: Both the strange matter and the craters could be related with a meteorite impact in historical time, especially with regard to strongly restricted terrestrial formation of gupeiite and xifengite and their occurrences in cosmogenic globular particles from the Yanshan area in China [16].

An industrial origin was considered because the iron silicides had been produced in the local industry as a completely unknown byproduct. An industrial production could largely be excluded because of many findings situations absolutely incompatible with anthropogenic support.

Here, we report on newly completed analyses of these iron silicide particles from different locations using various SEM and TEM techniques. They show the industrial hypothesis can be ruled out with a high degree of probability, and they suggest a cosmic, extraterrestrial origin.

The material (Fig. 2)

The mass of iron silicides so far sampled in the region totals roughly 2 kg. The size of the particles ranges between the order of a millimeter and a few centimeters. The largest piece is 6 cm long and 4 cm wide, with a weight of 162 g.

Some of the particles exhibit a spherical or ellipsoidal shape, but often a convex smooth front combines with a flat irregularly shaped rear side.

The surfaces show metallic lustre and lack practically any corrosion.

In many cases, a regmaglyptic surface resembling ablation features of the surfaces show metallic luster and lack practically any corrosion. They suggest a cosmic, extraterrestrial origin. Figs. 3-18

The peculiar occurrence of uranium without its decay products (Fig. 16) may be attributed to the fact that these metallic particles.

Analytical SEM, TEM and EBSD

Comprehensive SEM, TEM and EBSD analyses of 10 different iron silicide minerals that formed from a high temperature gas at early stages of the Solar System formations.

Silicon and titanium carbides (SiC, moissanite, (Ti, V, Fe/C) Jkhamrabaevite)

A significant feature of all analyzed iron silicide particles is their content of silicon and titanium carbides. They occur as extremely pure crystals and more finely dispersed in the matrix. The SiC has been analyzed to be the cubic moissanite mineral – (Ti, V, Fe/C) Jkhamrabaevite.

Moissanite crystals in part show multiple sets of closely spaced planar deformation features (PDFs) found in the NWA 1934 meteorite formed as high-pressure CaAl\textsubscript{2}O\textsubscript{4} phase imply a complex any lead was seen in the uranium spectra, and all other measured spectra (totaling some hundreds) proved to be free of lead, too.

Discussion and relations

The Chiemgau impact and meteorite crater strewn field

The Chiemgau strewn field [3, and references therein] comprises more than 80 mostly rimmed craters scattered in a region of about 60 km length and ca. 30 km width in the very South-East of Germany (Fig. 16, Fig. 1). The crater diameters range between a few meters and a few hundred meters. In the FRO 90228 ureilite [26], and Fe5Si3, mineral ferdisilicite, the high-pressure CaAl\textsubscript{2}O\textsubscript{4} phase occurring at high-temperature carbon allotropes [7, 13], some of these metallic particles. The occurrence of calcium aluminates, and silicon carbide, mineral	

Uranium

Uranium is in general associated with zirconium or without zirconium.

Except for traces of thorium in one spectrum only no other decay products were detected. The measured spectra (totaling some hundreds) proved to be free of lead, too.

The CAIs

The CAIs and their iron silicide host are not of terrestrial origin.

The CAIs is strongly evidence that the iron silicides are linked to the Chicxulub meteorite impact event.

Many finds in the Chiemgau area are practically excluding an anthropogenic deposition.

There is an obvious extraterrestrial relation of other gaseous and polyatomic iron silicide occurrences on earth.

There is a problematic formation of gupeiite and xifengite in a geologic oxygen-free environment.

Mineral ashenic particles are frequently incorporated in accretionary lapilli from the Chiemgau impact field.

Iron silicide particles are interspersing highly porous carbon recrystallization relics of probably carbonate origin.

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For the time being the general question remains unanswer whether the proposed shock was experienced by the iron silicides or in the terrestrial event of the Chiemgau impact.

Conclusions

For the iron silicide particles the intimate CAI coexistence of the high-temperature/low-pressure CaAl\textsubscript{2}O\textsubscript{4} krotite and the high-pressure CaAl\textsubscript{2}O\textsubscript{4} phase imply a complex any lead was seen in the uranium spectra, and all other measured spectra (totaling some hundreds) proved to be free of lead, too.

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References


The CAI cosmic relevance

Opponents and critics of the Chiemgau impact per se don’t grow tired of pointing to an industrial byproduct of the iron silicides [23]. They ignore –

Iron silicides occur in the most reduced meteorites.

– Cubic moissanite and titanium carbide exist in some meteorites and have been verified in cosmic dust.

– On Earth, the hapkeite, Fe5Si3 iron silicide (in its cubic form) is known from the Dhofar 280 lunar fragment, breccia meteorite [24] and has been reported for magnetic sand that are ascribed to cosmic dust and meteorite impact [25]. A grain similar in composition to hapkeite occurs in the FRO 90228 ureilite [26], and Fe5Si3, mineral ferdisilicite, the high-pressure CaAl\textsubscript{2}O\textsubscript{4} phase occurring at high-temperature carbon allotropes [7, 13], some of these metallic particles.

The occurrence of the many micrometer-sized rimmed craters on the surface of many iron silicide minerals at high magnification in Fig. 18) have found in the NWA 1934 meteorite formed as high temperature condensate from the solar nebula.

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