

**Fe<sub>2</sub>Si (HAPKEITE) FROM THE SUBSOIL IN THE ALPINE FORELAND (SOUTHEAST GERMANY): IS IT ASSOCIATED WITH AN IMPACT?**

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**Introduction:** Peculiar mm- to cm-sized metallic particles found in the subsoil of the Alpine Foreland raised attention because of a suspected extraterrestrial origin of the analyzed iron silicides Fe<sub>3</sub>Si, mineral gupeite, and Fe<sub>5</sub>Si<sub>3</sub> mineral xifengite [1, 2, 3]. Here in addition to an earlier study [4] we report on the verification of the later also established Fe<sub>2</sub>Si to be the mineral hapkeite and its relevance for a meteorite impact origin of the iron silicide pieces.

**Observations:** SEM and TEM analyses yielded a stoichiometrically heterogeneous iron silicide matrix in intimate however largely well-ordered accretion implying besides xifengite and gupeite also FeSi, FeSi<sub>2</sub> and Fe<sub>2</sub>Si. The matrix was shown to host extremely pure crystals of moissanite (SiC) and titanium carbide (TiC), and a broad variety of other elemental constituents (e.g., uranium, zirconium). Electron backscatter diffraction and TEM lattice constant analyses showed the moissanite to be the cubic modification (β)3C-SiC and at least some of the TiC crystals to be in fact the mineral khamrabaevite, (Ti,V,Fe)C. Undoubtedly, the Fe<sub>2</sub>Si was verified to be the mineral hapkeite.

**Discussion:** Many peculiar find situations of the iron silicides are basically incompatible with an industrial or in general anthropogenic product [4, 5]. This holds true also for a geogenic origin with regard to the extreme formation conditions of gupeite and xifengite [4]. On the other hand, iron silicides occur in the most reduced meteorites (ureilites, enstatite chondrites, achondrites). Cubic moissanite and titanium carbide exist in some meteorites and have been verified in cosmic dust. On earth, the hapkeite, Fe<sub>2</sub>Si, iron silicide is known from the Dhofar 280 lunar fragmental breccia meteorite [6] and has been reported for magnetic spherules in Hungary that are ascribed to cosmic dust or meteorite impact [7]. A grain similar in composition to hapkeite occurs in the FRO 90228 ureilite [8], and Fe<sub>2</sub>Si, together with TiC and supernova material, was established in the Orgueil meteorite [9].

**Conclusion:** From these analyses and within the specific context, the early supposition the strange metallic matter found in the Alpine Foreland might have a cosmic origin appears to be confirmed, and a relation to the Holocene meteorite impact strewn field in the region under discussion related with the so-called Chiemgau impact event [5] is suggested.

**References:** [1] Raeymaekers, B. and Schryvers, D. 2004. Paneth-Kolloquium Nördlingen. [2] Hoffmann, V. et al. 2004. Paneth-Kolloquium Nördlingen. [3] Fehr, K.T. et al. 2002. Status report. [4] Hiltl, M. et al. 2011. Abstract #1391. 42nd Lunar & Planetary Science Conference. [5] K. Ernstson et al. 2010. *Journal of Siberian Federal University Engineering & Technologies* 1, 3: 72-103. [6] Anand, M. et al. 2004. Proceedings of the National Academy of Sciences, 101: 6847-6851. [7] Szöör, Gy. 2001. Nuclear Instruments and Methods in Physics Research Section B, 181: 557-562. [8] Smith, C.L. et al. 2008. Abstract #1669. 39th Lunar & Planetary Science Conference. [9] Croat, T.K. et al. 2011. Abstract #1533. 42nd Lunar & Planetary Science Conference.