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Tetragonal shape of Cu_2S in recent hydrothermal deposits

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Abstract: The samples studied through this research were collected from active black smokers located in the mid-oceanic ridge from a depth of 2276m by a sea-born ship "Academician Mstislav Keldysh"(2002), in its 47th research mission. The collected samples were studied by microscopic, microprobe and X-ray analysis (Debye-sherer). These samples were in the form of narrow pipes with zoned structure, which included the following zones from the core to the margin: isocobanite, Chalcopyrite, Bornite and cupper sulfide zones. For the first time, it has been observed that tetragonal phase within the cupper-sulfide zone in recent sulfide, deposits. Tetragonal phase of Cu_2S, which is an unstable form of chalcocite, is stable only at high pressures (more than 0.8 Kb) and temperatures higher than 102 ^oC. The tetragonal form of Cu_2S in one of the studied samples was associated with Chalcocite-Djurleite mixture and in another studied sample was associated with chalcocite-Bornite mixture. Its average chemical composition was also determined as $Cu_{2.02}S$. It is likely that the emergence of this unstable phase in young hydrothermal deposits, which are formed at 250-350 ^oC, is not odd but after hydrothermal activity and temperature reduction it is changed to more stable phases. Evaluation of older black smokers showed no trace of tetragonal phase.

Keywords: *copper sulfides, tetragonal form of Cu_2S, recent hydrothermal deposits.*

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