WEATHERING-INDUCED RECRYSTALLIZATION OF KAMACITE. V.I.Grokhovsky, Physico-Technical Department, Ural State Technical University, Ekaterinburg 620002, RUSSIA.

The Bilibino and Aliskerovo iron meteorites was found during gold mining in more 200000 years age alluvio. The structure of meteorites was investigated in details with microscope and an electron microprobe. The recrystallized kamacite was the common structure peculiarity of these two iron meteorites from Magadan region

Bilibino iron meteorite is classified as coarsest octahedrite IIB [1]. Microscopically rained kamacite is formed by grain boundary migration, its motion started from kamacite/rabdite or kamacite/schrebersite interfaces. About 80 % of the sections area display recrystallized regions. The migration process is incomplete and recrystallized kamacite shows a series of concentric growth rings that seem to jumply forward. There is up to 0,4 wt. % Ni gradient between parent and new kamacite.

Aliskerovo IIIA meteorite has partly grained kamacite as well. The recrystallized kamacite grains are particularly common around schreibersite inclusions and Neumann band junctions. They cover about 4 % of the etched sections and their size range up to 50 micron. Recrystallized kamacite grains and migrating boundaries have more high etchingabilites by Nital.

Similar grained kamacite have also been observed in some others iron meteorites, e.g. Cedartown IIA, Indian Valley IIA, Mayodan IIA [2]. Previous model explained these structures as the cyclic cosmic reheatings up to 450°–550 °C which simultaneously started the recrystallization of the metallic matrix.

The structure of recrystallized kamacite with elongated taenite precipitation near metall/silicate contact was recently described in the Richardton (H5) chondrite [3,4]. It was identified discontinuous precipitation reaction at reheating to 350°–400 °C after strain at a lower temperature.

The new results indicate that the recrystallized kamacite in these two iron meteorites from Magadan region. produced by process, which has been termed diffusion induced grain boundary migration (DIGM). The overall motivation for DIGM must be change in chemical potential of the diffusing atoms when they engage in new grain generation as a result of the combined grain boundary diffusion and migration [5]. Evidence was obtained in this work that nucleation and recrystallization of new kamacite grains can be induced under weathering conditions when oxidizing agent atoms are diffuzed along phosphide/kamacite interfaces long time at such a low temperature that volume diffusion has stopped completely.

In summary, we suggest that weathering-induced recrystallization may be an important mechanism for the production grained kamacite in meteorites under terrestrial conditions as a precorrosion structure transformation phenomena.

References: [1] Zaslavskaja N. I. et. al. (1984) Meteoritika, 30-35, in Russian. [2] Buchwald V.F. (1975) Handbook of Iron Meteorites, vols.1-3, Univ. of California. [3] Axon H. J. and Grokhovsky V. I. (1982) Nature, 296, 835-837. [4] Grokhovsky V.I. and Axon H.J. (1982) J. Mater. Science Letters, 1, 485-488. [5] Balluffi R. W. (1982) Met. Trans., 13A, 2069-2095.