^{40}Ar-^{39}Ar AGE OF THE VETLUGA METEORITE.

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The Vetluga basaltic achondrite is composed of breccia and fragments of eucrite which are contained in matrix of fine-grained material of similar composition. The meteorite displays effect of multiple weak shocks that occured after formation of breccia and led to disorientation of microblocks of crystalls and in some cases, to twining of crystalls.

Two samples have been selected for our ^{40}Ar-^{39}Ar study. A sample 15225-1 having crystalls size from 100 to 1000 μm was hand picked from inhomogenously-grained eucrite fragments. A sample 15225 was taken from matrix of the meteorite and contains fragments of pyroxene and plagioclase crystalls cemented by fine-grained material.

The samples were irradiated together with the Bi-70 A standard in the nuclear reactor and received a fast neutron fluence of $\sim 3.10^{18} n/cm^2$. After the radioactivity has been reduced to an acceptable level analyses of Ar isotopic composition were carried out.

The ^{40}Ar-^{39}Ar plateau age of eucrite fragment is 3.66 ± 0.1 b.y. and the ^{40}Ar-^{39}Ar plateau age of matrix with pyroxene and plagioclase fragments is 3.54 ± 0.15 b.y. (Fig.1).

Earlier study on isotopic composition of Xe in eucrite clearly showed presence of the extinct ^{244}Pu spontaneous fission Xe. This fact implaies that a matter of the Vetluga achondrite has old age. If it was consolidated 3.5-3.6 b.y. ago fission product of the relatively short-lived ^{244}Pu ($T_{1/2}$=82 m.y.) would have been absent in the achondrite.

Plutonogenic Xe in the Vetluga achondrite is located in the mineral phase which displays the average ^{40}Ar-^{39}Ar age 4.4 ± 0.5 b.y. (Fig.2). Thus, possibly an age of 3.5-3.6 b.y. reflects the maximum time of shock impact on the parent asteroidal body which caused complete loss of early accumulated radiogenic argon or it reflects partial Ar loss at a later shock impact.

On the base of argon and xenon isotope date we calculated the cosmic ray exposure age of the Vetluga achondrite. The ^{38}Ar calculated exposure age is 17 ± 4 m.y. The ^{126}Xe-calculated exposure age is 23 ± 5 m.y. This age has same order of magnitude as ages earlier calculated for several achondrites-eucrites [1].

The history of the Vetluga achondrite may be considered as follows: The primary crystallization of a matter of the meteorite

^{40}Ar-^{39}Ar AGE.

Dang Vu Minh et al.

≃4.4 b.y.ago; strong impact causing complete loss of radiogenic argon; 3.6±0.1 b.y. ago; multiple weak impacts one of which led to fragmentation of the parent asteroidal body; 20±4 m.y.ago.

Reference: Podosek F.A.,Huneke J.C.,1973,Geochim.et Cosmoch.Acta, v.37,p.667.

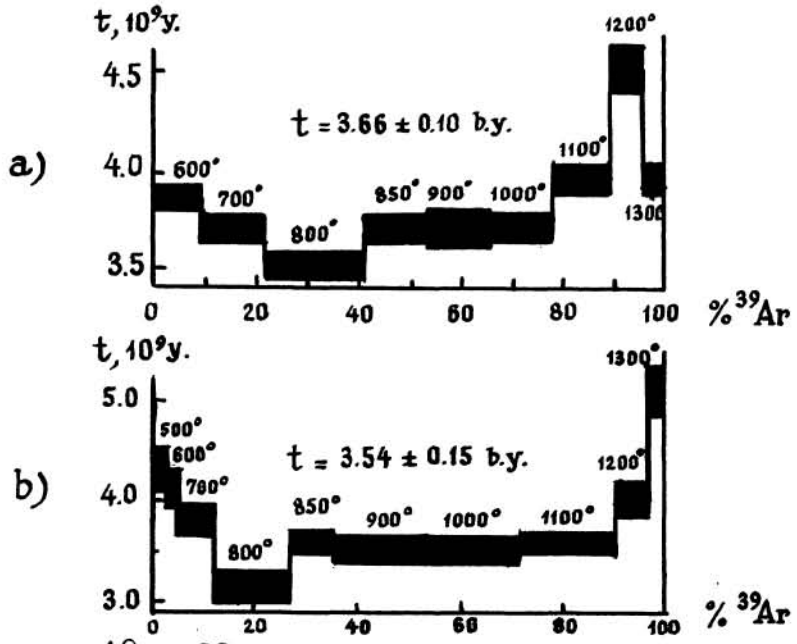

Fig.1 ^{40}Ar-^{39}Ar age spectra for two samples of the Vetluga achondrite.a-15225-1 inhomogenously grained eucrite;b-15225,matrix with fragments of pyroxene and plagioclase.The plateau ages are 3.66±0.1 and 3.54±0.15 b.y.

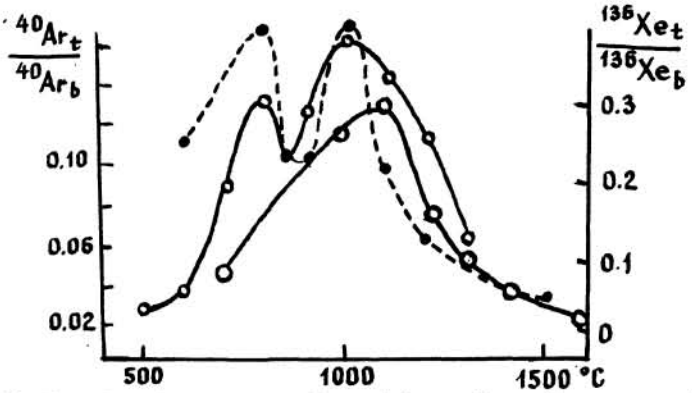

Fig.2 Variations on fractional release of Ar and Xe at stepwise heating on the Vetluga achondrite. "t"-temperature fraction,"b"-bulk content of Xe and Ar.