ON ORIGIN OF NEON-A; A.K.Lavrukhina and R.I.Kuznetsova; V.I.Vernadsky Institute of Geochemistry and Analytical chemistry, USSR Academy of Sciences, Moscow, USSR.

There are two distinct primary trapped componets of neon: neon-A and neon-B. Latter is solar neon of composition close but different from that of the solar wind. Neon-A is planetary neon. Its occurrence was suggested by a number of whole-rock analyses of carbonaceous chondrites. There are three hypothesises on the origin of neon-A. According to the first, neon-A is of primordial composition and its enrichment in Ne-22 is due to diffusive losses (1). According to the second, neon-A is an independent component formed from neon-B by isotopic fractionation within the same process which generated the elementally fractionated planetary component. (2). According to the third, neon-A is an in situ mixture of neon-E and of solar type trapped neon (3). Neon-E rich carrier phases have been separated from Orgueil CI carbonaceous chondrite (4) and from another chondrites. According to data (4), neon-E is pure Ne-22 (total Ne-20 and Ne-21 contamination less than 1%). It is obvious that a such phase could have been formed only by means of the decay of radioactive Na-22. Many scientists propose that the incorporation of Na-22 from explosive thermonuclear processes as the parent isotope of neon-E seems the more likely explanation for the origin of neon-E. However, there is still one nucleosynthesis process for the neon-E formation. There are nuclear reactions with high-energy particles accelerated by shock waves which arise during supernova event (5,6).

We have made calculations for the model based on the idea (4), and have used the neon isotope contents in the bulk Orgueil material (7). For that model we have $^{20}Ne\text{-}A = {}^{20}Ne\text{-}B + {}^{20}Ne\text{-}C$; $^{21}Ne\text{-}A = {}^{21}Ne\text{-}B + {}^{21}Ne\text{-}C$ and $^{22}Ne\text{-}A = {}^{22}Ne\text{-}B + {}^{22}Ne\text{-}C + Ne\text{-}E$. Using the isotopic ratio data for neon-A: $^{20}Ne/^{22}Ne=8.2$ and $^{21}Ne/^{22}Ne=0.025$, for neon-B: $^{20}Ne/^{22}Ne=13.7$ and $^{21}Ne/^{22}Ne=0.03$; for neon-C: $^{20}Ne/^{22}Ne=0.853$ and $^{21}Ne/^{22}Ne=0.917$, we have obtained that the $^{22}Ne\text{-}A$ value is equal to (in atoms/10^6 atoms Si) : 4.24×10^{-4} (from $^{22}Ne\text{-}B$)+5.5×10^{-6} (from $^{22}Ne\text{-}C$)+2.8×10^{-4} (from Ne-E). From that data is to be expected that : (a)-for planetary neon the ratio of Ne-E/$^{22}Ne\text{-}B=0.66$, (b)-the Ne-E (^{22}Na) content in bulk Orgueil is equal to 2.74×10^{-4} atoms/10^6 atoms Si, and (c)-taking in to account of the Na content (6×10^4 atoms/10^6 atoms Si) the ratio of $^{22}Na/^{23}Na=4.6\times10^{-9}$ at the begining of gas retention. These data were used for the estimation of the accelerated proton flux which was necessary for the formation of Na-22 in gaseous matter of cosmic composition. The calculations have made for the $^{22}Ne(p,n)^{22}Na$ reaction at the spectral index value γ =6 and E cut-off=1; 14 and 20 MeV. We have found that $Ip(Ep > 20\ MeV)=6\times10^{15} cm^{-2}$. Proton flux of such density may be only expected from supernova event.

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According to our calculations (8), to explain the cosmic abundances of the Li, Be and B isotopes it is necessary to evalate the integral proton flux as $I_p(E_p > 14\ MeV)=1.5\times10^{20}$ cm^{-2}, $\gamma=6$, E cut-off=14 MeV and $\alpha/p=6\times10^{-4}$. At these parameters of irradiation the Na-22 content is equil to 6 atoms/10^6 atoms Si. The comparison of this value with the Ne-E (^{22}Na) content in bulk Orgueil, calculated by us, gives the time of the begining of neon retention. The value of $\tau=40$ years after the end of nucleosynthesis.

The found value for the ^{22}Ne-C content was used for the calculation of a proton flux irradiated the grains. The nuclear reactions of protons with the Na, Mg, Al, Si and Fe nuclei have taken in to account. For the $\gamma=3.5$ we have obtained $I_p(E_p > 14\ MeV)=1.4\times10^{14} cm^{-2}$. Proton flux of such intensivity does not contradict to the conclusion that the cosmogenic components of neon in bulk Orgueil have formed at stage of irradiation of meteorite body by galactic cosmic rays.

We suppose that planetary neon is an independent component of neon which in primary dust of protoplanetic nebula was present. In that model the trapped neon is a mixture of neon-B and neon-A for every cosmic body. The ratios of neon-B/neon-A have decrease with increasing of heliocentric distance of cosmic body.

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