THE Ne-A2 COMPONENT IN NANODIAMOND OF METEORITES: A POSSIBLE ORIGIN.
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Introduction. The Ne-A2 [1] on isotopic composition does not correspond to neon in zones of supernova [2], at explosion of which was formed the Xe-HL component of xenon [3]. Therefore the association of the Ne-A2 with Xe-HL in nanodiamond of meteorites is explained to those that Ne-A2 is either the initial neon of supernova, i.e. not changed by nucleogenesis, or this neon was trapped by diamond grains in interstellar environment [1, 3]. In the given work it is suggested the possible origin of Ne-A2 on the basis of the neon from helium (He/C) and (or) hydrogen zones of the type II supernova [2].

Model of formation of the Ne-A2. We assume that the Ne-A2 is one of possible versions of neon (further is designated as Ne-X), which could be formed in result of mixture of two subcomponents. One of them is neon of helium (He/C) and (or) hydrogen zones of the type II supernova. The other subcomponent of Ne-X is spallation neon, formed in nuclear reactions with fast particles accelerated in front of shock waves at explosion of supernova [4].

The possible relation of a subcomponents of Ne-X in nanodiamond of meteorites can be determined on dependence between the contents of $^{21}Ne_{exc}$ and ^{132}Xe-HL (Fig.). The $^{21}Ne_{exc}$ values are calculated as follows:

$$^{21}Ne_{exc}=[^{22}Ne]\times\{(^{21}Ne/^{22}Ne)-(^{21}Ne/^{22}Ne)_{P3}\}$$

Here $[^{22}Ne]$ and $(^{21}Ne/^{22}Ne)$ are measured the ^{22}Ne contents and $^{21}Ne/^{22}Ne$ ratios, the $(^{21}Ne/^{22}Ne)_{P3}$ – is $^{21}Ne/^{22}Ne$ ratio for neon of P3 component. The data for calculations of $^{21}Ne_{exc}$ and the contents of ^{132}Xe-HL were taken from [1, 5].

Assuming, that neon in nanodiamond of meteorites is a mixture of Ne-X, Ne-P3, and cosmogenic neon (Ne-C), the dependence of $^{21}Ne_{exc}$ from ^{132}Xe-HL can be expressed as follows:

$$^{21}Ne_{exc}={}^{22}Ne_{C}\times[(^{21}Ne/^{22}Ne)_{C}-0.029] + (^{22}Ne_{X}/^{132}Xe_{HL})\times[(^{21}Ne/^{22}Ne)_{X} - 0.029]\times{}^{132}Xe_{HL},$$

where $^{22}Ne_{C}$ and $^{22}Ne_{X}$ – the contents Ne-C and Ne-X, respectively, $(^{21}Ne/^{22}Ne)_{C}$ and $(^{21}Ne/^{22}Ne)_{X}$ - the $^{21}Ne/^{22}Ne$ ratio for these components. This dependence is the equation of straight line such as $y=a+bx$, if the values $(^{21}Ne/^{22}Ne)_{C}$, $(^{21}Ne/^{22}Ne)_{X}$, $^{22}Ne_{X}/^{132}Xe_{HL}$, and $^{22}Ne_{C}$ for nanodiamond of meteorites are constant.

One can see on Fig., the linear dependence (straight line on Fig.) is observed for group of meteorites. The deviations from this regression line of the data for nanodiamond of other meteorites are due to their raised radiation age (the Kainsaz, Tieschitz, Ragland and Mezo Madaras meteorites), or to the higher $^{22}Ne_{X}/^{132}Xe_{HL}$ ratio (the Orgueil and Boriskino meteorites).

The Ne-X can be the real component, if it is formed before implantation in nanodiamond, or the imaginary component, if it is formed in result of mixing its subcomponents only at destruction of nanodiamond grains.

The Ne-X is the real component. The analysis of $^{21}Ne_{exc}$ vs. $^{132}Xe_{HL}$ dependence has shown, that if $(^{21}Ne/^{22}Ne)_{X}$ is equal 0.036, as for Ne-A2, then the $(^{20}Ne/^{22}Ne)_{X}$ ratio should be equal 8.53±0.09. This value coincides with the $^{20}Ne/^{22}Ne$ ratio for the Ne-A2 [1]. Using other values of $(^{21}Ne/^{22}Ne)_{X}$, it is possible to obtain other values of $(^{20}Ne/^{22}Ne)_{X}$ ratio. For example, at the $(^{21}Ne/^{22}Ne)_{X}$=0.1, the $(^{20}Ne/^{22}Ne)_{X}$ value is equal 7.30±0.16. Hence, the isotopic composition of the Ne-A2 is one of possible versions of Ne-X isotopic composition.

The criterion for a choice of unequivocal of $(^{21}Ne/^{22}Ne)_{X}$ value is not revealed by us on the given investigation stage. Therefore both above-mentioned values of this ratio are probably, as well as the others its values.

As it should be, the calculated contents of $^{22}Ne_{X}$ at $(^{21}Ne/^{22}Ne)_{X}$=0.036 have coincided with the Ne-A2 contents in [1]. The content of Ne-X sharply decreases at high values of $(^{21}Ne/^{22}Ne)_{X}$. So, at $(^{21}Ne/^{22}Ne)_{X}$=0.1, the relative contents $^{22}Ne_{X}$ does not exceed 10%. Basic quantity of neon in nanodiamond of meteorites in this case is the Ne-P3 component of neon. The preservation of Ne-P3 at thermal metamorphism may be result of the following factors.

1. The atoms of neon at implantation were mainly retained in traps with high activation energy. Therefore the diffusive loss of Ne-P3 at

thermal metamorphism were minimal in contrast to Xe-P3.

2. The density of structural defects from ions of neon in nanodiamond grains at implantation was insufficient for their graphitization at thermal metamorphism, as it can occur, e.g., with grains containing Xe-P3 [6].

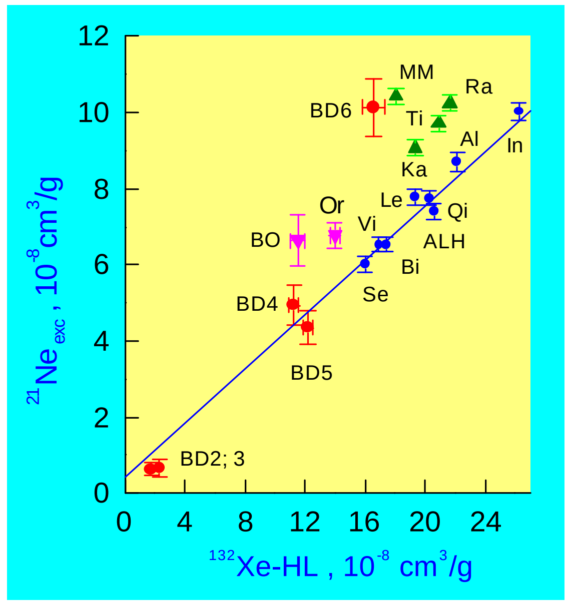
Thus, the contents of the Ne-X in nanodiamond of meteorites can be sharply various, e.g., high at $(^{21}Ne/^{22}Ne)_X$=0.036 or low at $(^{21}Ne/^{22}Ne)_X$=0.1.

The Ne-X is the imaginary component. In this case the Ne-X subcomponents were implanted independently from each other in population of nanodiamond grains containing Xe-HL. Therefore Ne-X as imaginary component is formed only at destruction of nanodiamond grains. If the associated with Xe-HL subcomponent of Ne-X is the neon from helium zone of supernova only then almost all neon in nanodiamond of meteorites is due to the noble gases of P3 component.

As implantation of the Ne-X subcomponents in nanodiamond grains could occur under various conditions, their relation in different grain-size fractions can be not the same. As a result the isotopic composition of Ne-X in grain-size fractions of nanodiamond will be various. Therefore, probably, the data for grain-size fractions of the Boriskino nanodiamond deviates from the regression line (Fig.) in a different extent. The carried out by us calculations have shown, that for the bulk of Boriskino nanodiamond, as well as for Orgueil, the $(^{21}Ne/^{22}Ne)_X$ and $(^{20}Ne/^{22}Ne)_X$ can be equal, e.g., 0.554 and 0.552, accordingly, while for its the most fine-grain fraction they are equal to 0.117 and 0.194, and for the most coarse-grain fraction they are equal to 0.787 and 0.742, respectively.

Conclusion. The Ne-A2 component in nanodiamond of meteorites may be one of possible versions of Ne-X, which is formed in result of mixing of two subcomponents. One of them is the neon from helium (He/C) and (or) hydrogen zones of supernova, another a subcomponent is the spallation neon, formed at explosion of supernova. The Ne-X can be either real component, if the mixture of its subcomponents has taken place before implantation in nanodiamond grains, or imaginary, if the subcomponents were implanted independently from each other.

References. [1] Huss G. and Lewis R. (1994) *Meteoritics*, *29*, 791-810. [2] Meyer B. et al. (1995) *Meteoritics*, *30*, 325-334. [3] Clayton D. (1989) *Astrophys. J.*, *540*, 613-619. [4] Lavrukhina A. and Ustinova G. (1992) *Astronom. Vestnik (in Russian)*, *26*, 62-71. [5] Fisenko A. et al. (2004) *Geochem. Intern.*, *42*, 708-719. [6] Fisenko A.V. and Semjonova L.F. (2005) *Astronom. Vestnik (in Russian)*, *39*, 342-352.



Designation on Figure: Al – Allende, ALH – ALHA77214, Bi – Bishunpur, BO – Boriskino, In – Indarch, Ka – Kainsaz, Le- Leoville, MM – Mezo Madaras, Or – Orgueil, Ra – Ragland, Qi – Qingzhen, Ti – Tieschitz, Se – Semarkona, Vi – Vigarano. BD2-6 are the grain-size fractions of Boriskino nanodiamond. BD2 and BD3 fractions are most fine grained, BD6 is most coarse grained.