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GROSNAJA ABCs: MAGNESIUM ISOTOPE COMPOSITIONS. J.N.Goswami[1], G.Srinivasan[1] and A.A.Ulyanov[2]. [1]Physical Research Laboratory, Ahmedabad - 380 009, India. [2]Geological Department, Moscow State University, Moscow - 119 899, Russia.

Three CAIs from the Grosnaja CV3 chondrite were analysed for their magnesium isotopic compositions by the ion microprobe. The selected CAIs represent three distinct types: GR4(compact Type A), GR7 (Type B) and GR2(Type C). Petrographic studies indicate that all the three Grosnaja inclusions were subjected to secondary alterations.The Type A CAI GR4 is primarily composed of melilite with spinel and pyroxene occuring as minor phases. The rim of the inclusion does not exhibit distinct layered structure and secondary alteration products (garnet, Fe-rich olivine and Na-rich plagioclase) are present in some localised areas near the rim region. The average major element compositions of different mineral phases in GR4 are given in Table 1. Preliminary REE data suggest a depletion of HREE relative to LREE by about a factor of 3 without any clear indication of interelement fractionation. The CAI GR7 has textural and minerological characteristics similar to Type B inclusions. The REE data show a pattern that is similar to Group VI with enrichment in Eu and Yb. In addition, a depletion of HREE compared to LREE is also evident in this object. Melilite composition shows a broad range of akermanite content (Ak_{15-55}). Detailed petrographic study is in progress. GR2 is a anorthite-rich Type C inclusion with large plagioclase laths intergrown with Ti-rich pyroxene. The average plagioclase composition is close to pure anorthite(An99). There are however some altered

Table 1. Major element composition of mineral phases in Grosnaja CAIs†.

	GR2(Type C)					GR4 (Type A)			
	Anorthite	Pyroxene Core	Pyroxene Mantle	Spinel	Garnet	Pyroxene	Melilite	Spinel	Garnet
SiO_2	42.46	42.02	47.18	0.07	35.07	35.86	26.81	0.04	38.99
TiO_2	0.08	5.16	2.50	0.38	0.01	9.55	0.03	0.35	0.01
Al_2O_3	36.44	14.42	9.72	70.53	0.04	21.64	28.83	71.78	22.79
Cr_2O_3	0.03	0.27	0.67	0.79	0.01	0.09	0.03	0.25	< 0.01
V_2O_3	< 0.01	0.16	0.13	0.33	< 0.01	0.15	0.01	0.41	0.01
MgO	0.11	11.76	13.31	27.36	0.17	7.53	3.20	28.02	2.45
CaO	20.04	25.59	25.49	0.08	33.43	25.28	41.10	0.16	34.93
FeO	0.10	0.16	0.21	0.53	28.26	0.02	0.08	0.08	1.35
MnO	0.01	< 0.01	0.04	0.02	0.01	< 0.01	0.01	0.03	0.02
Na_2O	0.15	0.01	0.01	–	0.01	0.01	0.03	–	0.01
K_2O	0.01	< 0.01	< 0.01	–	0.01	< 0.01	< 0.01	–	< 0.01

† All values are based on averages of 3 to 15 individual analysis

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Na-rich plagioclase with lower anorthite content. Secondary phases like garnet and calcite are also present. The Ti-content of pyroxene is different in the core and in the mantle region of this inclusion(Table 1).

The magnesium isotopic studies were carried out using a Cameca IMS-4F ion microprobe. The Mg-Al data for none of the inclusions defines a well-behaved pattern. The data for the Type A inclusion GR4 is consistent with absence of of radiogenic ^{26}Mg, although the $(^{26}Mg/^{24}Mg)_i$, based on both spinel and melilite is a few permil above the normal value (0.13932). In the case of the Type B inclusion GR7 data for melilite with $^{27}Al/^{24}Mg \geq 10$ suggest the presence of radiogenic ^{26}Mg with $(^{26}Al/^{27}Al)_o$ of $\sim 2 \times 10^{-5}$, but no well behaved Mg-Al systematics could be discerened if one considers data for all the melilite with $^{27}Al/^{24}Mg$ ratio spanning the range of 2 to 16. The Type C inclusion GR2 has anorthite with $^{27}Al/^{24}Mg$ clustering around the value of 350 and along with the pyroxene data yield a normal initial magnesium isotopic composition and $(^{26}Al/^{27}Al)_o$ of $(3.3 \pm 0.8) \times 10^{-6}$. Data for anorthite near an altered zone (pyroxene, garnet and calcite assemblage) is consistent with a even lower value for $(^{26}Al/^{27}Al)_o$ of 2×10^{-6}. Intrinsic magnesium isotopic fractionation, F(Mg), of plagioclase and Ti-rich pyroxene has been measured using lake-county plagioclase and Angra-dos-Reis pyroxene as laboratory standards. The absence of positive fractionation for these phases is consistent with a lack of intense volatilization during the melting events experienced by these objects (1,2).

The Mg-Al systematics in the three different types of inclusions from the Grosnaja CV3 chondrite is a clear pointer towards the role of secondary processes leading to the disturbed Mg-Al systematics. Hutcheon et al.(3) have, however, preferred to interpret the Mg-Al systematics in another altered Grosnaja CAI (Max) in terms of heterogeneity of $^{26}Al^*$ or late formation of the object. Although the role of secondary alteration had been noted in most of the earlier magnesium isotopic studies of CAIs, its possible implications towards understanding the distribution of $^{26}Al^*$ in the solar nebula has been emphasised only recently. (4,5,6)

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