FeO-RICH XENOLITHS IN THE STAROYE PESYANOE AUBRITE. C. A. Lorenz[1], M. A. Ivanova[1], G. Kurat[2,3], F. Brandstaetter[2]. [1]Vernadsky Institute of Geochemistry, Kosygin St. 19, Moscow, Russia, 119991. c-lorenz@yandex.ru. [2]Naturhistorisches Museum, A-1010 Vienna, Austria. gero.kurat@univie.ac.at [3]Institute of Geological Sciences, University of Vienna, A 1090 Vienna, Austria.

Introduction: The Staroye Pesyanoe aubrite (SP) is a polymict gas-rich breccia, consists predominantly of enstatite but contains also abundant forsterite, albitic feldspar, glasses and glass spherules. We analysed five polished sections (2.8 cm^2 total sample area) with optical microscopy, ASEM, and EMP, and found nine non-aubritic, FeO-rich minerals and lithic clasts, possibly related to ordinary chondrites (OC) and carbonaceous chondrites (CC). The xenoliths demonstrate accretion of chondrite-like particles onto the surface of the aubrite parent body (APB). However, the flux of interplanetary dust seems to have been different from that on the HED parent body and Earth by composition and intensity. It could indicate that the APB sampled the dust at a different time or moved through a different region of the Solar System than did the HED parent body and the Earth.

Results: One pyroxene xenocryst (8 µm), three olivine xenocrysts (15-30 µm) and five xenoliths (30-100 µm) were found. The pyroxene xenocryst ($En_{84}Wo_{2.1}$; Fe/Mn=10) is set in an enstatite matrix of SP and contains no inclusions. Three olivine xenocrysts (Fo_{78}–Fo_{88}; Fe/Mn=40) have angular shape and contain tiny inclusions of Cr- and Mn-poor troilite.

Xenolith #1 is 100 µm and consists of olivine Fo_{84}, troilite and some albitic feldspar ($Ab_{83}An_{12}$) or glass.

Xenolith #2 is 50 µm and consists of two anhedral grains of orthopyroxene ($En_{87}Wo_{0.2}$; Fe/Mn=22) and augite of variable composition ($En_{57}Wo_{35}$ - $En_{61}Wo_{28.5}$) in a glassy mesostasis of feldspathic composition ($Ab_{83}An_{15}$), containing also tiny grains of Ti-poor troilite. Ortho- and clinopyroxenes are Cr_2O_3-rich (0.5 and 1.34 wt.% Cr_2O_3, respectively).

Xenolith #3 is 100 µm in size and consists of subhedral olivine ($Fo_{98.4}$) and euhedral pyroxene ($En_{80.8}Wo_{7.4}$) grains in a glassy feldspathic ($Ab_{68.8}An_{24.8}$) mesostasis (Fig. 1). The tiny pyroxenes are also set around grains of olivine.

Xenolith #4 is a 30 µm zoned clast consisting of pyroxene ($En_{98.7}Wo_{1.1}$) with FeO-rich rim ($En_{89.9}Wo_{3.1}$) and inclusion of Ti,Cr-poor, Ni-rich (3.5 wt.% Ni) troilite (Fig. 2). The FeO-rich rim has no zoning on the contact with enstatite of SP clastic matrix.

Xenolith #5 (Fig. 3) is a 100 µm carbonaceous chondrite clast, consists mainly of fine-grained phyllosilicate matrix into which olivine (Fo_{85}) and troilite grains are embedded.

Discussion: The compositions of FeO-rich olivine xenocrysts in SP correspond to that of H-chondrites in both major and minor element abundances. The pyroxene xenocryst has major and minor element abundances similar to those in rare isolated pyroxene fragments found in the matrix of the ALHA 78113 aubrite [2]. The xenocrysts probably are not co-genetic with the xenoliths because the olivine/pyroxene ratio among the mineral clasts is higher than that of the rock fragments.

The xenoliths found in this study are less magnesian and contain less olivine than an FeO-rich xenolith described from SP before [1] and similar FeO-rich materials found in other aubrites [2, 3], which also correspond to H chondrites. The augite of xenolith #3 is similar to clinopyroxenes of ureilites in its high contents of Cr_2O_3. The Cr_2O_3-rich clinopyroxenes of FeO-rich clasts from ALHA 78113 were previously found to be of cosmochlore-like (Na_2O-rich) composition [4].

The carbonaceous xenolith is the first found within enstatite meteorites. The composition of its phyllosilicates (Fig. 4) is close to those from Orgueil [5] and therefore the xenolith could be related to the CI group of carbonaceous chondrites.

The wide compositional range of olivine xenocrysts, lack of equilibrium between the olivine and pyroxene in the xenoliths and their textural varieties could indicate that the particles originated from a highly unequilibrated source or from several different sources. This last possibility is supported by the fact that both OC-like and CC-like clasts were found.

The xenocrysts and xenoliths have no shock features, suggesting accretion onto the SP PB must have taken place with low relative velocity. The absence of reactions between the xenocrysts/xenoliths and the aubrite material and occurrence of the unequilibrated FeO-rich clast suggest that accretion took place at low temperature and that SP did not experience thermal metamorphism after the FeO-rich material was mixed in, as shown for the FeO-rich clasts of Cumberland Falls and ALHA 78113 aubrites [4].

We suggest that the accretionary flux onto the APB (-s) was less intense and had a different abundance ratio of CC/OC (~ 0.1) than that encountered by the Earth and the HED PB (CC/OC ~ 100-1000) [6, 7]. This could mean that accretion onto the APB occurred at a different time than onto the HED PB, or that the

APB traveled through an unusual region of the early Solar System.

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References: [1]°Ivanova M. A. et al. (2002) *LPSC XXXIII,* abs. #1080. [2]°Kimura M. (1993) *Proc. NIPR Symp. Antarct. Met. 6,* 186-203. [3]°Neal C. and Lipschutz M. (1981) *LPSC XII,* 762-764. [4]°Lipschutz M. et al. (1988) *GCA 52*, 1835-1848. [5]°Weisberg M. et al. (1993) *GCA* 57, 1567-1586. [6]°Kurat G. et al. (1994) *GCA 58,* 3879-3904. [7]°Zolensky M. et al. (1996) *Meteoritics & Planet. Sci 31*, 518-537

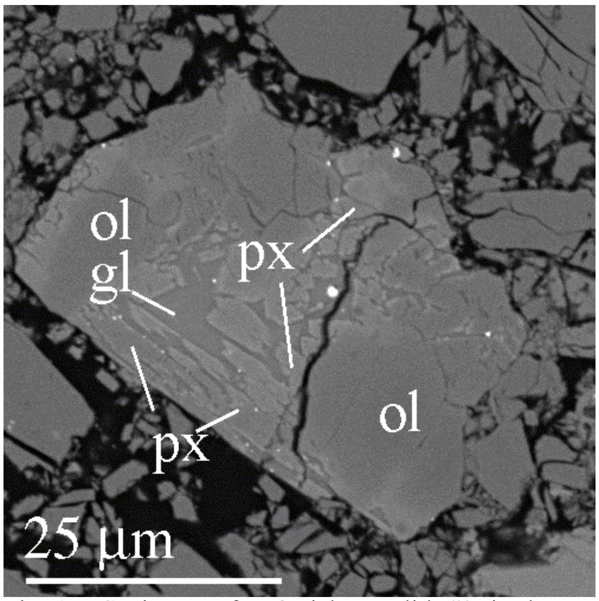

Fig. 1. BSE image of FeO-rich xenolith #3, in the enstatite matrix of SP. Ol is olivine, px is pyroxene, gl is glass.

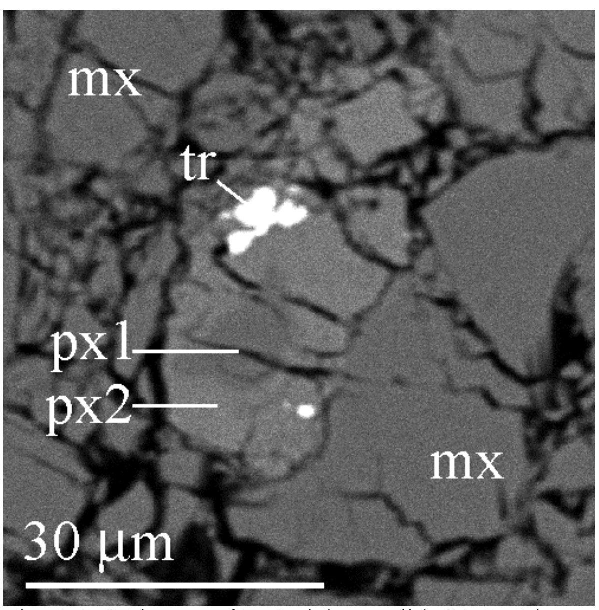

Fig. 2. BSE image of FeO-rich xenolith #4. Px1 is pyroxene core, px2 is FeO-rich pyroxene rim, tr is troilite, mx is enstatite matrix of SP.

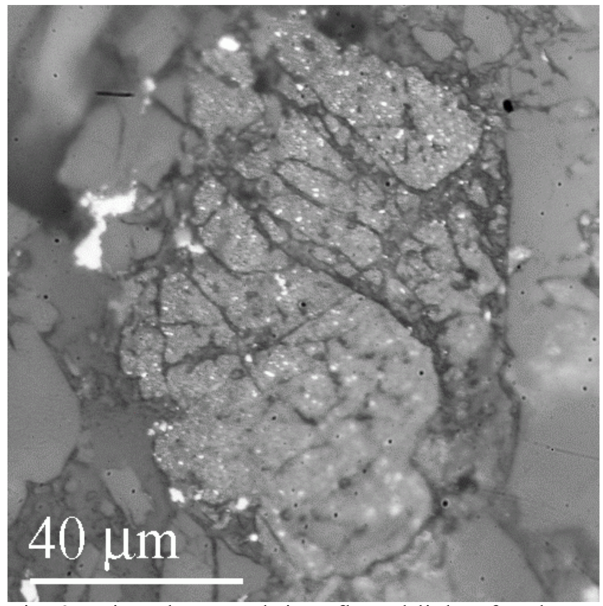

Fig. 3. Microphotograph in reflected light of carbonaceous chondrite xenolith in the clastic matrix of SP. Grey is phyllosilicates and silicate grains, white is sulfides.

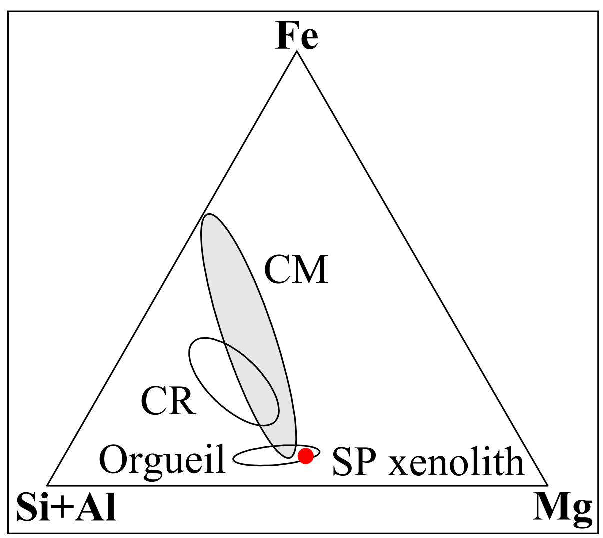

Fig. 4. The composition (atomic %) of phyllosilicates of SP carbonaceous chondrite xenolith in comparison with that of CM, CR and CI (Orgueil) chondrites (compositional fields are from [5]).