NEW UNIQUE BRACHINITE-LIKE ACHONDRITE CALAMA 029.

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Introduction: Meteorite Calama 029 was found in 2017 by URFU Meteorite Expedition to the Atacama desert in Antofagasta province (Chili). As a result of research meteorite Calama 029 is a unique achondrite that has no analogues among any known meteorites. In this study we make assumptions about the mechanisms of formation and the parent body of the meteorite Calama 029.

Materials and Methode: We studied two polished section of the meteorite Calama 029 by optical microscope in transmitted and reflected lights, by SEM JSM 6390LV (Jeol) with EDS X-max 80 in Common Use Center "Geoanalyst" IGG UB RAS. Cu isotope composition was measured by TIMS TRITONE PLUS in "Geoanalyst" IGG UB RAS.

Results: Petrographic observation of a polished section shows a fine-graned recrystallized poikilitic texture. Achondrite consist of olivine Fa31 (N=15) 65%, orthopyroxene En73Fs25Wo2 (N=12) 15%, clinopyroxene En45Fs11Wo44 (N=9) 5-7%, plagioclase An20 (N=9) 10%, chromite 2-3%, troilite 3-4%, Fe-Ni-metal < 0,5%, accessory apatite and ilmenite. Olivine grains are 50-300 μm in size, however we observed large olivine grains up to 800 μm in size. Such olivine grains contains plagioclase, troilite and metal inclusion. One relict bared olivine (BO) chondrule was found in thin section of the achondrite. This chondrule has a recrystallized boundaries and contains enstatite and clinopyroxene inclusion. This apparently indicates intense recrystallizaton of the initial chondrule.

Olivine contains MnO 0.4 wt.%. Clinopyroxene has slight variations in composition. Plagioclase contains K_2O 0.6-1.3 wt.%. The average composition of chromite (N=8): SiO_2 0.6%, TiO_2 3.6%, Al_2O_3 5.1%, Cr_2O_3 54.6%, FeO 32.1%, MnO 0.6%, MgO 1.6%, V_2O_3 1.0%, ZnO 0.3%. The average composition of FeNi-metal (N=13): Fe 49.0%, Ni 47.8%, Co 2.5%. Meteorite Calama 029 has high $\delta^{65}Cu/^{63}Cu$ 4.19‰.

Optical features (sharp extinction of olivine) indicate that the sample is very weakly or not shocked (S1). Heavy oxidation of metal and troilite, beginning alteration of mafic silicates. Weathering grade is W3.

Discusion: Definitely, the meteorite Calama 029 is a primitive achondrite. This is indicated by the content of the rare relict chondrule and the fine-graned recrystallized texture of the meteorite.

Composition of olivine, orthopyroxene, clinopyroxene and plagioclase in this meteorite is similar to mineral composition of brachinites. However, this meteorite has small content of olivine 65% and has fine-graned poikilitic texture. Orthopyroxene predominate to clinopyroxene in this meteorite. While brachinite is dunitic to wherlitic rocks with granoblastic to protogranular medium to coarse-grained texture. Brachinite content of olivine 75-95% and characterized by majority of clinopyroxene to orthopyroxene. The meteorite texture are similar to an acapulcoite. However the meteorite contains more ferroan olivine and more ferroan pyroxene unlike the acapulcoites. We offer to classified this meteorite us the unique brachinite like achondrite.

Many researchers identifies the formation of brachinites with magmatic processes on parent asteroids [1-4]. Meteorite Calama 029 has not igneous structure and obviously formed by metamor-phism of the chondrite. We suppose the meteorite Calama 029 is an unmelted primitive precursor for brachinite meteorites.

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