OPAQUE MINERALS IN THREE NEW METEORITES OF ORDINARIES (L5) CHONDRITE GROUP

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ABSTRACT

This paper reports on the study of opaque minerals in themost recent Brazilian meteorites: Varre-Sai, fell in Varre-Sai, Rio de Janeiro State, on June 19th, 2010; a new Brazilian chondrite, Lavras do Sul, found in 1985 at Lavras do Sul, Rio Grande do Sul State; and also… They are classified as ordinary chondrites (L5) which mean poor in iron L and equilibrated petrologic type 5.

Perhaps the most surprising primary mineral found in ordinary chondrites is an elemental iron-nickel (FeNi), hereafter referred to as metal. When an ordinary chondrite is cut and polished to reveal its interior composition and texture, the metal is immediately obvious as bright, star-like metallic grains against the backdrop of the matrix. The metal is an iron-nickel alloy. The iron is always alloyed with nickel in meteorites. The nickel content can be as little as 5% or as much as 25%. The remaining iron is found in combined form as iron oxides, sulfides, phosphides, or combined in olivines and pyroxenes. In etched samples the taenite shows a cloudy core and a tetrataenite rim that can reach 1-3μm thick. Under optical microscopy the cloudy core is composed of tetrataenite and sometimes martensite.

Scattered throughout the matrix of the meteorite are submillimeter to millimeter-sized spherical inclusions called chondrules and the rock that contains them, chondrites. The three studied meteorites aretypical olivine-hypersthene ordinaries chondrites. Their mineralogical compositions are chiefly olivine and low-Ca plus some polysyntheticaly twinned clinopyroxene and plagioclase. The meteorites were submitted to the Nomenclature Committee (NomCom) of the Meteoritic Society and approved.

The investigated samples were deposited in MuseuNacional / UFRJ. From these thin polished sections were etched (nital 2%) and investigated by a Petrographic microscope Zeiss Axioplan in transmitted and reflected polarized light and a small fragments were powdered for the Mossbauer spectra of ^{57}Fe, at room temperature,

The opaque minerals are troilite (FeS), chromite ($FeCr_2O_4$), magnetite (Fe_2O_3) and Fe-Ni metal phase.

Troilite appearance in reflected light exhibits the characteristic bronze color; it occur as prominent elongate fragments scattered in the matrix surrounding chondrules; and some grains are associated with metals. Chromite exhibits subhedral crystals, associated with troilite and silicate phase mainly olivine, shows moderate reflectivity in gray-white color with internal reflectance in brownish tint. Magnetite occurs in rounded and angular small grains spread in silicates with moderate reflectivity in grey. The metal phases are kamacite (BCC iron) and high-nickel taenite (FCC iron). In etched samples the taenite shows a cloudy core and a tetrataenite rim. Kamacite appears in irregular shapes and occurs in intergrowth to taenite in plessite complex. Some of them exhibit Neumann lines.

The Mossbauer spectra, after separationfrom the silicates and troilitephases., contain only kamacite, small amounts of taenite, antitaenite.thus showing an overlapping of paramagnetic and magnetic phases.

The use of reflected polarized light is a clue in the study of chondrites. Under polarized reflected light the silicates show transparent luminosity.