A NEW R CHONDRITE (NWA 6236) FROM FEZZOU, MOROCCO

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An R chondrite-like meteorite (NWA 6236) was collected at Fezzou, Morocco (30°58.29'N, 4°56.99'W) in September 2005. Based on petrographical features, mineral chemistry, and oxygen isotope ratios, this meteorite shows characteristics of an R chondrite. This study of our petrographical analysis of NWA 6236 is based on microscopy and EPMA areal compositional mapping, mineral chemistry by EPMA, C, N, S abundances, stable oxygen and carbon isotopes, and the results of cathodoluminescence (CL) and thermoluminescence (TL) measurements.

This meteorite (ca. 6 x 3 x 3cm, 145g) with a dark bluish-gray fusion crust, exhibits an unbrecciated chondritic texture consisting of various types of chondrules and their fragments embedded in a recrystallized olivine-rich matrix. The chondrules are made up of porphyritic to cryptocrystalline olivine, barred olivine, and porphyritic to granular olivine and pyroxene. The size of chondrules varies from 0.1 mm to 0.9 mm in diameter.

The most abundant mineral is olivine, associated with Ca-pyroxene and plagioclase. Ca-poor pyroxene, pentlandite, pyrrhotite, apatite, chromite and chalcopyrite are present as accessory minerals. The olivine is homogeneous with a composition ranging from Fa_{36} to Fa_{42}, with a maximum at Fa_{39}. The pyroxene is composed of two phases, Ca rich pyroxene ($Fs_{8-21}Wo_{34-47}$) and Ca poor pyroxene ($Fs_{15-31}Wo_{0-10}$).

Carbon and sulfur contents are 0.22 wt% and 3.71wt%, respectively. Carbon, oxygen, and sulfur stable isotope ratios are as follows; $d^{13}C = -15.11 \pm 0.11$ ‰. (vs. PDB), $d^{18}O = 4.70 \pm 0.07$‰ (vs. SMOW), $d^{17}O = 5.53 \pm 0.08$ ‰ (vs. SMOW), and $d^{34}S = 0.6 \pm 0.15$ ‰ (vs. CDT).

The $d^{17}O$ value is higher than the ordinary chondrite groups, and corresponds to the isotopic range of R chondrites. Mean composition of the olivine (Fa_{39}) agrees with the olivine composition obtained from R chondrites compared to ordinary chondrites. Furthermore, the Fs content of the Ca-pyroxene has a value of $Fs_{11.9}$ which is similar to the Ca-pyroxene composition of R chondrites so far reported. Therefore, we conclude that NWA 6236 belongs to the R chondrite group.

Induced TL glow curve of NWA 6236 is measured to determine petrologic type. The TL sensitivity of NWA 6236 is petrologic subtype 3.7 [1]. However, the olivine indicates coefficient variation of 3.9% on the basis of fayalite contents, suggesting the petrologic type 4 or more. These results imply that a shock metamorphism probably make TL sensitivity reduce.

CL spectra of the Na-rich feldspar exhibit an intense emission band at ~400 cm^{-1}, assigned to structural defect centers. There is no emission in the yellow to red spectral region. These CL features suggest that the feldspar was affected by shock metamorphism because of the presence of shock induced defects and the elimination of other luminescence centers such as Mn^{3+} and Fe^{3+} activators common in feldspar.

References: [1] Sears D. W. G. et al. 1991. *Proceedings of Lunar and Planetary Science Conference* 21:493-512