MULTIWAVELENGTH RAMAN SPECTROSCOPY OF ORGANIC MATTER IN ISHEYEVO MICROXENOLITHS

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Isheyevo is a metal-rich CH/CB chondrite [1] which contains abundant carbonaceous xenoliths. These xenoliths are generally <1 mm in size, composed by a fine-grained matrix supporting anhydrous silicates, carbonates, magnetite, sulfides and metal grains [2]. Poorly organized macromolecular organic matter (OM) is present in all the xenoliths and shows different degrees of structural order [2]. High enrichments in ^{15}N have been measured in some xenoliths, while no D enrichments have been detected [3-5]. Based on mineralogy, petrography and the structural order of the organic matter, Isheyevo xenoliths have been classified in three groups, and it has been proposed that they originated from three previously unsampled parent bodies [2].

In this study we go further in the structural characterization of macromolecular OM in five Isheyevo xenoliths by using multiwavelength Raman spectroscopy. We collected Raman spectra using four different excitation wavelengths (244, 457.9, 514.5 and 785 nm) to take advantage of the so-called dispersion effect, i.e. the analysis of how spectral parameters change with excitation wavelength [6-8]. This is expected to provide more precise data than analyses based on single excitation wavelength spectra. Spectra of insoluble organic matter (IOM) extracted from the carbonaceous chondrites Orgueil, Tagish Lake, Murray, Renazzo and from the metamorphosed CM2s WIS 91600 and PCA 91008 have been collected for comparison.

OM in two out of five Isheyevo xenoliths (#28 and #30) and IOM of WIS 91600 and PCA 91008 show Raman spectra collected with visible excitation wavelength without important fluorescence. In contrast high level of fluorescence are present in the spectra of the other samples. The dispersion of D-band and G-band peak position indicates that OMs in xenoliths #28 and #30, and IOM of WIS 91600 and PCA 91008 are dissimilar to OM in other objects. This suggests the effect of an alteration process, possibly by heating, but different from long duration thermal metamorphism, as observed in type 3 chondrites [9, 10]. However, WIS 91600 and PCA 91008 IOMs are not strictly similar to OM of Isheyevo xenoliths #28 and #30. The OM structure in one ^{15}N-rich xenolith appears similar to the IOM from Renazzo and (to a lesser extent) CMs. Significant differences are reported with respect to Orgueil IOM. These results suggest the accretion from different parent bodies, which experienced different alteration histories.

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