Microscopic laser Raman imaging of carbonaceous matter in Kenna ureilite

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On the origin of the diamond in the ureilite, several mechanisms, such as impact metamorphism from the graphite and uptakes of the vapor phase growth diamond etc. have been proposed, In this paper, distribution pattern of the carbonaceous matter in Kenna meteorite will be discussed on the basis of imaging of carbonaceous matter in thin section and plate samples using microscopic laser Raman spectroscopy.

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The specimen of the thin section was prepared only using the corundum to prevent the contamination of the diamond during the surface polishing. A commercial specimen of the 3 mm thickness was used as a plate samples.

JRS-System2000 microscopic laser Raman spectrometer was used for the measurement. For the excitation light source, Ar+(514nm) and He-Ne (633nm) were used. Ar+ laser was used for the acquisition of the filter image, to reduce the overlapping fluorescent as a background. In usual Raman spectrum, both exciting light was independently used, and the data of 200-4000cm-1 region was acquired.

When the He-Ne light source was used, the spectrum of the corundum was observed. This is considered due to the resonance-Raman. Although diamond was easily found at cracking part in the thin section sample, it was difficult to find the graphite. In the plate sample, it was very difficult to find diamond, and the graphite was detected in the wide area. It is supposed that during the surface polishing for preparation of thin section the selective peeling of the graphite was generated. In the plate sample, the selective peeling of the diamond was probably occurred.

The imaging combining with the spectrum measurements suggested the followings: (1) pure graphite not accompanied with diamond was observed at many positions in the meteorite, (2) the diamond is usually locates close to graphite, therefore the spectrum of the diamond overlapped with the spectrum of the graphite in many cases. However the imaging indicates graphite and diamond exist separately, (3) when the focus is carefully adjusted using the high magnification objective, clear spectrum of diamond was observed accompanied by the wide peak near at 2080 and 1610 cm-1, (4) the spectra of diamond were accompanied by intense fluorescence in most case, the location of the fluorescent materials, however, has not always made the one-to-one correspondence to that of the diamond.

The above observations seem to give significant information on the formation mechanism of diamond in ureilite. The precise examination on the details of the observations is under way.