Alteration of chemical structure of coronene by shock wave

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A series of organic compounds belonging to polycyclic aromatic hydrocarbon (PAH) exists in space, planets, and meteorites. Coronene is one of them, and it is thought that coronene is closely related with the process in which graphite and kerogen-like compounds formed out of the earth. In this paper, we would like to report the detail of the chemical structure of the compound derived when the coronene received the impact. The product was concentrated in the mother liquor on crystallization of coronene. The product was finally separated by high performance liquid chromatography. It was suggested by spectroscopic examination using IR, UV, and NMR that, although the symmetrical structure of the coronene had been lost, the degree of polymerization of the compound was not large.

There are various phenomena having the energy in which cause the change of the structure of organic molecules in the space. The energy by the shock wave is also one of them. On the other hand, in polycyclic aromatic hydrocarbon (PAH), there are a series of organic compounds that exists in the space, planet, and meteorite. Coronene is one of them, and it seems to closely relate to the formation process of graphite and kerogen-like compound in the extraterrestrial conditions. We are performing a series of research about structural change of the organic compound by the shock wave. In this paper, we would like report the detailed of the examination of the compound induced when the coronene received an impact. The impact was applied to the sample strongly confined in an iron capsule by hitting with a polycarbonate projectile of 1g in speed 7 km/s. The crystal of the coronene is the long needle, and it is generally flocculent. The shock wave not efficiently propagated in the sample, even if this crystal was packed very tightly in the capsule. The sample that used this time raised propagation efficiency of the shock wave by using 1:2 mixtures of iron powder and coronene. In the separation of the product, it was utilized that the product was concentrated in the mother liquor of crystallization of coronene.

Toluene was used as the solvent, and heated at 100 oC for dissolution. At the first step, insoluble iron powder was removed by filtering the hot solution. It was confirmed that the crystal that deposits the filtrate by cooling, was the coronene by ultraviolet spectrum (UV) and infrared spectrum (IR). The product was concentrated by separation from coronene with repeating the heating and cooling. The product was taken out by separating with the high performance liquid chromatography, because the coronene has still been mixed with finally got filtrate. The UV absorption at longer wavelength (362 and 383 nm) of the product than that of coronene (302 and 339 nm), indicated that the product have extended aromatic electron-conjugation. IR spectrum of the product showed the absorptions indicating the presence of aliphatic carbon-hydrogen bond and oxygen function. The NMR spectra suggested that although the deformation of symmetric structure of coronene in the product was caused, polymerization was not proceeded extensively in the product.