

Q11a PAHs in QCCs

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QCCs (Quenched Carbonaceous Composites) are condensates from a hydrocarbon plasma. These materials are good candidates for interstellar carbonaceous dusts. The products from the plasma are (1) gases, (2) a filmy material (filmy-QCC), and (3) a dark material similar to soot (dark-QCC). Using a mass-spectrometer, we analyzed (1) gases evaporated from the dark-QCC, (2) gases evaporated from the filmy-QCC by laser heating (by Clemett and Gillette), and (3) gases evaporated from the filmy-QCC by heating in a small oven (by A. Sakata).

As reported at the previous annual meeting of Astronomical Society of Japan (Kaito et al., March, 1997), the dark-QCC contains onion-like spherical particles that are 5-10 nm in diameter. It is formed from graphitic layers with many site defects. By laser heating of the dark-QCC, molecules adsorbed on or weakly bonded to the dark-QCC are evaporated. The mass spectrum of the gases shows two mass envelopes. The spectrum has a peak at 228 amu (atomic mass units) in the low mass envelope and at 398 amu in the high mass envelope. These peaks show the presence of PAHs. Compact large PAHs such as ovalene ($C_{32}H_{14}$, 398 amu), circumanthracene ($C_{40}H_{16}$, 496 amu), circopyrene ($C_{42}H_{16}$, 520 amu), etc, match the observed peaks in the high mass envelope. We have not found any clear evidence for any 5-membered ringed molecules in the mass spectrum.

The filmy-QCC deposited on a substrate is not a uniform material. The filmy-QCC deposited near the plasmic chamber (with a brown color) probably has higher mass than the deposit far from the plasmic chamber (with a yellow color). However, mass-spectrometer analysis of the filmy-QCC shows that the condensate is made from many types of PAHs.