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Characterization of black carbon materials using pyrolysis-GC-MS technology

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Pyrolysis-gas chromatography-mass spectrometry (Py-GC-MS) was used to investigate chemical features varied derived black carbon materials (BC). BC samples included hexane soot, gasoline soot, diesel soot, coal soot, HLJ soot, GZ soot, wood charcoal, and rice charcoal. The data of Py-GC-MS show that identified pyrolysates of eight BC samples were similar. Aromatic compounds were the most dominant pyrolysates, a little of aliphatic and N, S heteratomic compounds were detected also. These suggest that chemical structure of eight BC is similar and has a highly aromatic, with aromatic nuclei crosslinked by aliphatic chain-like bridges. The nuclei appear to be formed mainly from condensed aromatic homo- or heterocyclic rings. Bridges that crosslink nuclei together are linear or branched aliphatic chains, and/or oxygen- or sulfur-containing functional groups. Due to varied fuels and combustions, many differences were identified among varied derived BC materials. Soot-BC has a more condensed refractory structure than charcoal-BC. The pyrolysates evolved from soot-BC can reflect combustion condition and contain more higher contents of N-containing structure unit. Whereas charcoal-BC can retains some plant chemistry, Py-GC-MS analysis can provide the original plant information. S-containing structures only present in three fossil fuel soots, none of the other soot and charcoal BC materials.