Perylene in Lake Biwa, Japan

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Perylene, which is a polycyclic aromatic hydrocarbons (PAHs) that consists of five benzene-rings, has been widely found throughout the world, but it has different vertical distributions compared to other PAHs. Since the discovery of perylene in aquatic sediments, many researchers have reported the abundance of perylene in both marine and lacustrine sediments and have discussed its source, route to sediments, reactions, etc. Lake Biwa is the largest lake in Japan and its sediment commonly contain very high amounts of perylene (μg g^{-1}-level). Thus, Lake Biwa must be a suitable site for elucidation of perylene origin and transforming process as well as its possibility for an indicator of environmental change.

In the dated-sediment core collected from near the river's mouth in Lake Biwa, concentration of perylene increased with increase of terrestrial materials and a transformation of perylene from its precursor compounds is ongoing within the deeper layers of sediments. Moreover, no remarkable concentration of perylene has been observed in the sinking particles collected from water at 5 m above the lake bottom. These results suggest that sedimentary perylene originates from outside the lake and that a transformation of perylene from its precursor compounds occurs mainly after deposition in Lake Biwa. The stable carbon isotope compositions (δ13C values) of perylene in Lake sediment (–27.8‰ ± 0.3‰) was clearly more negative than those of Japanese aquatic plants (C3, –16.5‰ to –14.6‰), it can be considered that the perylene originated from the land, principally from gymnosperms. Furthermore, it was clarified that transformation of perylene from 4,9-dihydroxyperylene-3,10-quinone (DHPQ), which originates from *Cenococcum geophilum*, a type of rhizobia, in a catchment area at Lake Biwa. Because a remarkable amount of DHPQ also exists in the humic acids of soils and because the inputs of compounds to the lake depend strongly on the rivers, precursor of perylene in the Lake Biwa sediment must originate from the land. Considering the fact that perylene showed the temporal increase corresponding to layer of the flood in the dated-core (Isewan Typhoon in AD 1959), perylene should be a useful indicator of flood in sediment cores.