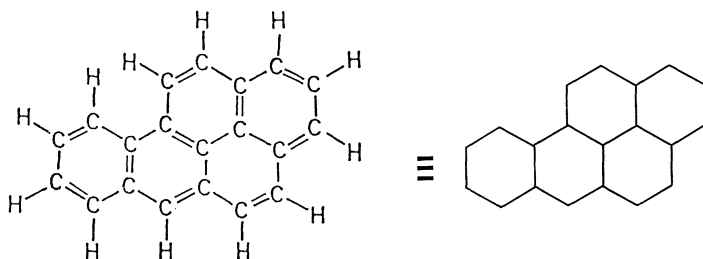


Benzenoid Hydrocarbons

1.1 Acquaintance

Benzenoid hydrocarbons are condensed polycyclic unsaturated fully conjugated hydrocarbons composed exclusively of six-membered rings. Some of their representatives are depicted in Fig. 1.1. The structural formulas of benzenoid hydrocarbons are given in the usual abbreviated form:



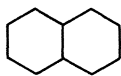
The distribution of the π -electrons in a benzenoid hydrocarbon is not correctly represented by any (Kekulé-type) classical structural formula with double bonds between certain pairs of carbon atoms. This problem will be thoroughly examined in subsequent parts of the present book. In this chapter we simply write the structural formulas without any indication of the π -electrons.

In the current chemical literature the so-called *polycyclic aromatic hydrocarbons* (PAHs) are frequently mentioned. Therefore the distinction between the class of polycyclic aromatic hydrocarbons and the class of benzenoid hydrocarbons should be made clear at this early point.

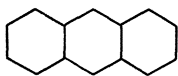
Polycyclic aromatic hydrocarbons may contain rings with sizes different from six (usually five-membered rings) and/or carbon atoms which do not participate in the conjugated π -electron network (i.e. sp^3 hybridized carbon atoms) and/or side-groups.

Some examples of this type are fluoranthrene (1), fluorene (2), hexahydrobis-anthene (3), and methylcoronene (4), presented in Fig. 1.2.

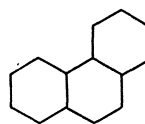
Benzenoid hydrocarbons are not allowed to possess the structural features mentioned above. On the other hand, a PAH is by definition aromatic; this stipulates a pronounced degree of thermodynamic and chemical stability. Some



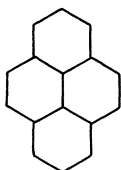
naphthalene, $C_{10}H_8$
colorless, mp $80^{\circ}C$



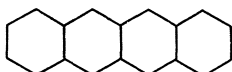
anthracene, $C_{14}H_{10}$
colorless, mp $216^{\circ}C$



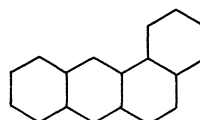
phenanthrene, $C_{14}H_{10}$
colorless, mp $101^{\circ}C$



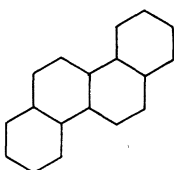
pyrene, $C_{16}H_{10}$
colorless, mp $150^{\circ}C$



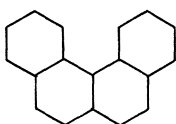
naphthacene, $C_{18}H_{12}$
orange-red, mp $356^{\circ}C$



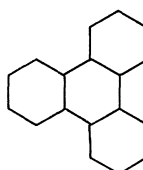
tetraphene, $C_{18}H_{12}$
colorless, mp $161^{\circ}C$,
carcinogenic



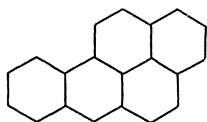
chrysene, $C_{18}H_{12}$
colorless, mp $254^{\circ}C$,
carcinogenic



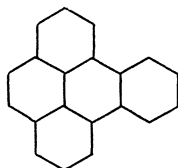
benzo[c]phenanthrene, $C_{18}H_{12}$
colorless, mp $66^{\circ}C$,
carcinogenic



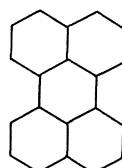
triphenylene, $C_{18}H_{12}$
colorless, mp $198^{\circ}C$



benzo[a]pyrene, $C_{20}H_{12}$
pale yellow, mp $178^{\circ}C$,
carcinogenic



benzo[e]pyrene, $C_{20}H_{12}$
colorless, mp $179^{\circ}C$



perylene, $C_{20}H_{12}$
orange-yellow, mp $273^{\circ}C$