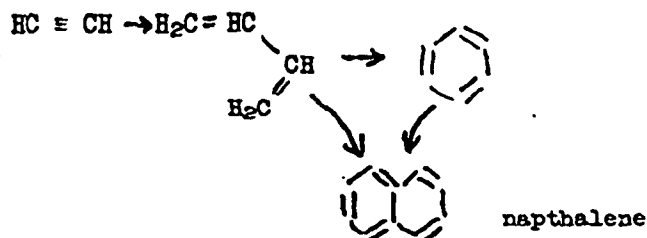


temperature vapor pressure of the order of 10^{-3} mm Hg (e.g., cetane, $C_{18}H_{38}$) and hence could not exist alone in a condensed phase unless the surrounding atmosphere were about 1 ppm diesel fuel by volume (10 ppm by weight); this illustrates the proposition that complex processes must be at work in order that certain species be observed at all.

Common to both gasoline exhausts and diesel exhausts, and indeed to combustion of any fossil fuel, are compounds called polycyclic hydrocarbons or polynuclear aromatic hydrocarbons (PNA). A few of them are shown in Fig. 6. There are a number of related compounds which, though not strictly hydrocarbons, should be considered along with the PNA's; examples are shown in Fig. 7.

PNA's are produced in greatest amount when the engine is run rich. They are present in gasoline to the extent of a few ppm, of which some 0.1 to 0.2% survives the combustion process and is emitted in the exhaust (see Ref. 24). A primary source of PNA's in exhaust, however, is thought to be a buildup from molecular fragments formed by pyrolysis of fuel or lubricating oil in the combustion chamber (see Ref. 8 Ch. 20, Refs. 39, 45):



and so forth. About 30 PNA's have been found in automobile exhaust. They amount to some 0.1% of the particulate from a gasoline engine and a similar (Reference 46) percentage of the particulate from a diesel engine.