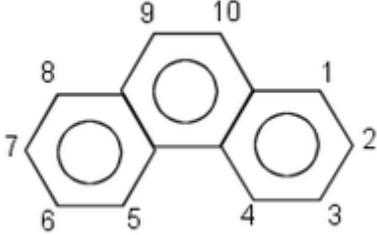


Phenanthrene

Phenanthrene	
	
IUPAC name	Phenanthrene
Identifiers	
CAS number	[85-01-8]
PubChem	995
SMILES	<chem>c1ccc2c(c1)ccc3ccccc32</chem>
InChI	1/C14H10/c1-3-7-13-11(5-1)9-10-12-6-2-4-8-14(12)13/h1-10H
Properties	
Molecular formula	C ₁₄ H ₁₀
Molar mass	178.23 g/mol
Melting point	99 °C
Boiling point	340 °C
Solubility in water	insoluble
Except where noted otherwise, data are given for materials in their standard state	

(at 25 °C, 100 kPa)

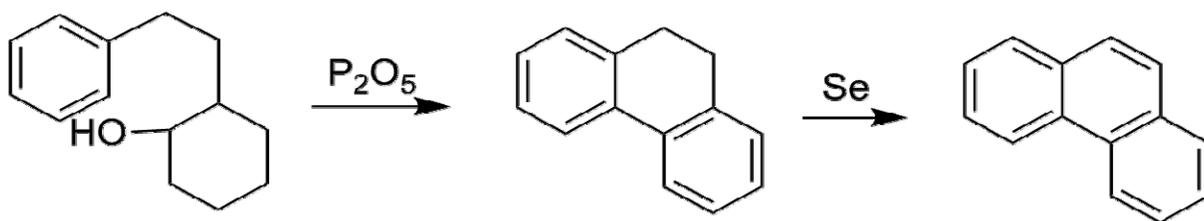
Phenanthrene is a [polycyclic aromatic hydrocarbon](#) composed of three fused [benzene](#) rings. The name *phenanthrene* is a composite of [phenyl](#) and [anthracene](#). It provides the framework for the [steroids](#). In its pure form, it is found in [cigarette smoke](#) and is a known [irritant](#), [photosensitising](#) skin to light. Phenanthrene appears as a white powder having blue fluorescence.

The compound with a phenanthrene skeleton and nitrogens at the 4 and 5 position is known as [phenanthroline](#) or 4,5-diazaphenanthrene (IUPAC name).

Chemistry

Phenanthrene is insoluble in water but is soluble in most organic solvents such as [toluene](#), [carbon tetrachloride](#), [ether](#), [chloroform](#), [acetic acid](#) and [benzene](#).

A classical phenanthrene synthesis is the *Bardhan-Sengupta Phenanthrene Synthesis* (1932).^[1] In the second step of this reaction 9,10-dihydrophenanthrene is oxidized with elemental [selenium](#).



Phenanthrene can also be obtained photochemically from certain [diarylethenes](#).

Reactions of phenanthrene typically occur at the 9 and 10 positions, including:

- [Organic oxidation](#) to phenanthrenequinone with [chromic acid](#)^[2]
- [Organic reduction](#) to 9,10-dihydrophenanthrene with [hydrogen](#) gas and [raney nickel](#)^[3]
- [Electrophilic halogenation](#) to 9-bromophenanthrene with [bromine](#)^[4]
- [Aromatic sulfonation](#) to 2 and 3-phenanthrenesulfonic acids with [sulfuric acid](#)^[5]
- [Ozonolysis](#) to diphenylaldehyde^[6]

Canonical forms

Phenanthrene is more stable than its linear isomer [anthracene](#). A classic and well established explanation is based on [Clar's rule](#). A novel theory invokes so-called stabilizing [hydrogen-hydrogen bonds](#) between the C4 and C5 hydrogen atoms.

Natural occurrence

Ravatite is a natural analogue of (synthetic) phenanthrene. It was found in little amounts among few burning coal sites. Ravatite represents a small group of organic minerals.

References

1. chempensoftware.com [Link](#)
2. [Organic Syntheses](#), Coll. Vol. 4, p.757 (1963); Vol. 34, p.76 (1954)
3. [Organic Syntheses](#), Coll. Vol. 4, p.313 (1963); Vol. 34, p.31 (1954)
4. [Organic Syntheses](#), Coll. Vol. 3, p.134 (1955); Vol. 28, p.19 (1948)
5. [Organic Syntheses](#), Coll. Vol. 2, p.482 (1943); Vol. 16, p.63 (1936)
6. [Organic Syntheses](#), Coll. Vol. 5, p.489 (1973); Vol. 41, p.41 (1961)

External links

- [Phenanthrene](#) at scorecard.org

v · d · e	<u>Polycyclic aromatic hydrocarbons</u>
2 rings	Azulene · Naphthalene
3 rings	Acenaphthylene · Anthracene · Fluorene · Phenanthrene
4 rings	Chrysene · Fluoranthene · Pyrene · Tetracene · Triphenylene
5+ rings	Anthanthrene · Benzo[a]pyrene · Corannulene · Coronene · Dicoronylene · Helicene · Hexacene · Ovalene · Pentacene · Picene · Perylene

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